

TROPICAL STORM ALLISON

June 5-9, 2001

Prepared by:

John P. Ivey, PE, CFM

Halff Associates, Inc.

Gulf
of
Mexico



Tropical Storm Allison

NOAA-16 AVHRR HRPT (1KM)
Multi-spectral False Color Image
June 5, 2001 @ 1925 UTC

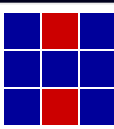
ASCE

Spring 2002 Meeting
Arlington, Texas
March 27-30, 2002

Tropical Storm Allison (TSA)

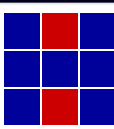
*“The most **extensive tropical** storm in US history”*

- First Named Storm of the 2001 Atlantic Hurricane Season
- First tropical storm to strike the upper Texas coast since Francis in 1998.
- **More deadly than Hurricane Alicia** (22 lives lost with Allison). Allison caused 43 deaths nationwide.
- Tropical Storm Claudette holds national rainfall record of 43” in a 24-hour period. Tropical Storm Allison is close behind with 36.99” at the Port of Houston and 29.86” at Thibodaux, LA.
- **TSA Rainfall exceeded 500-year intensity** in 2/3 of Harris County’s 22 watersheds.



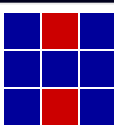
TSA *(continued)*

- The maximum rainfall rate recorded in the Greens Bayou watershed was 28.5" in a 10.5 hour period where the PMP is estimated to be 32.5" in a 12 hour period.
- 73,000 residences and 95,000 automobiles were flooded.
- **Damages exceed \$5B.**
- **NFIP has paid over 30,000 flood damage claims** in Texas and Louisiana for over \$1B.
- Allison flooded portions of Texas, Louisiana, Mississippi, Alabama, Georgia, Florida, North Carolina, Pennsylvania, and Virginia



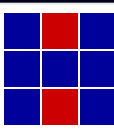
TSA *(continued)*

- The average annual rainfall for Houston is 46.07 inches and the **first nine days in June 2001 produced 35.7% of the annual expected rainfall.**
- Thanks to excellent flood forecasting and warning there were no drowning deaths in flooded homes. This is remarkable with over 73,000 flooded homes.
- The 22 deaths in Houston related to TSA:
 - **12 driving**
 - **6 walking**
 - **3 electrocutions**
 - **1 elevator**



TSA *(continued)*

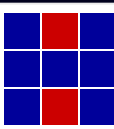
- Prior to TSA, the Harris County Flood Control District (HCFCD) completed over \$4 Billion in structural and non-structural flood control projects.
- Over the past 12 years HCFCD purchased 440 properties at a cost of \$40M.
- Approximately 1600 Harris County Repetitive Loss Properties have been identified for “fast track” acquisition and relocation after TSA.
- The Galveston District COE estimates that over \$246M in damages were prevented by Federal Flood Control Projects in Harris County during TSA.



TSA *(continued)*

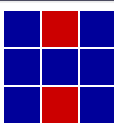
Allison was perhaps the best documented disaster event in US history due to utilization of the Web.

- **National Weather Service**
www.srh.noaa.gov
- **Harris County Office of Emergency Management**
www.hcoem.org
- **USGS Real Time Flow**
<http://waterdata.usgs.gov/tx/nwis/current/?type=flow>
- **FEMA**
www.fema.gov
- **TNRCC**
www.tnrcc.state.tx.us



TSA *(continued)*

- TxDEM
www.txdps.state.tx.us
- Harris County FIRMs
www.efloodmap.com
- NGS Benchmark Data Sheets
www.ngs.noaa/datasheet.html
- USGS Topographic Maps
www.topozone.com
- NWS Allison Report
www.srh.noaa.gov//hgx/projects/allison01.htm
- Texas General Land Office
www.glo.state.tx.us



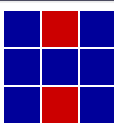
TSA *(continued)*

- NWS Web page
www.srh.noaa.gov//hgx/projects/allison_01.htm

This Web site includes rainfall, flood photos and a link to the NWS Service Assessment.



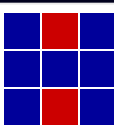
I commend the NWS for producing an excellent storm report.



TSA *(continued)*

President Bush declared 30 Texas counties a Disaster Area immediately following the flood event.

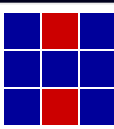
- **Disaster Response by Federal and State Agencies.**
- **Jack Quarles, PE, and Gary Zimmerer, PE, lead the FEMA Technical Services Team.**
- **HCFCD utilized it's Cooperative Technical Partner (CTP) with FEMA to assist local communities in the flood recovery process.**
- **FEMA utilized the HCFCD - Harris County Map Assessment as justification to restudy and the 142 DFIRM panels covering 35 communities in Harris County.**
- **FEMA and Harris County Flood Control District (HCFCD) initiated the Tropical Storm Allison Flood Recovery Project (TSARP).**



TSA *(continued)*

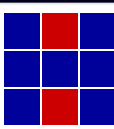
The Tropical Storm Allison Flood Recovery Project (TSARP) is a “fast track” effort that includes:

- Harris County Flood Control District survey teams preparation of inundation maps and surveying high water marks during and immediately following TSA
- Harris County Map Needs Assessment and Map Needs Update Support System (MNUSS) database
- National Weather Service Tropical Storm Allison Flood Report and Service Assessment
- Substantial Damage Determinations to “fast track” Acquisition and Relocation Project of approximately 1600 repetitive loss properties



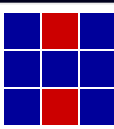
TSA *(continued)*

- Funding, selection of consultants, and initiation of TSARP with an initial estimate of \$16.5M
- Creation of a Website www.tsarp.org
- Public Meetings and Press Events
- New County-Wide LIDAR Mapping (12 cm+/-)
- Base map preparation using HGAC STAR-Map
- Hydrology analysis of 22 watersheds (1750 sq.mi.)
- Post Event Analysis
- NGS efforts to re-level 1st order 2000 Datum bench marks
- Documentation of subsidence measurements



TSA *(continued)*

- Field surveys of over 10,000 channel cross sections
- Utilize LIDAR to define floodplain in overbank areas
- Hydraulic Analysis of 202 studied streams
(1,200 stream miles)
- Digital Floodplain Mapping - 142 DFIRM panels
- Four (4) major committees
(Executive, Technical, Stakeholders and Users)
- Draft (Preliminary) FIS and FIRM's
- Public Review
- Resolution of Technical Appeals
- Final adoption of FIS and publication of DFIRM's
(Target date is June 2004)



TX

LA

MS

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**Buffalo Bayou White Oak Bayou
Confluence and Main St. – 6/9/01 am**





**Buffalo Bayou, Looking upstream
from Main St.– 6/9/01**





Clear Creek, Gulf Meadows Subdivision

6/6/01





Clear Creek, Green Tee Terrace Subdivision – 6/6/01



Surfers @ Freeport



Day 1 – 6/5/01

**Day 1
June 5, 2001**

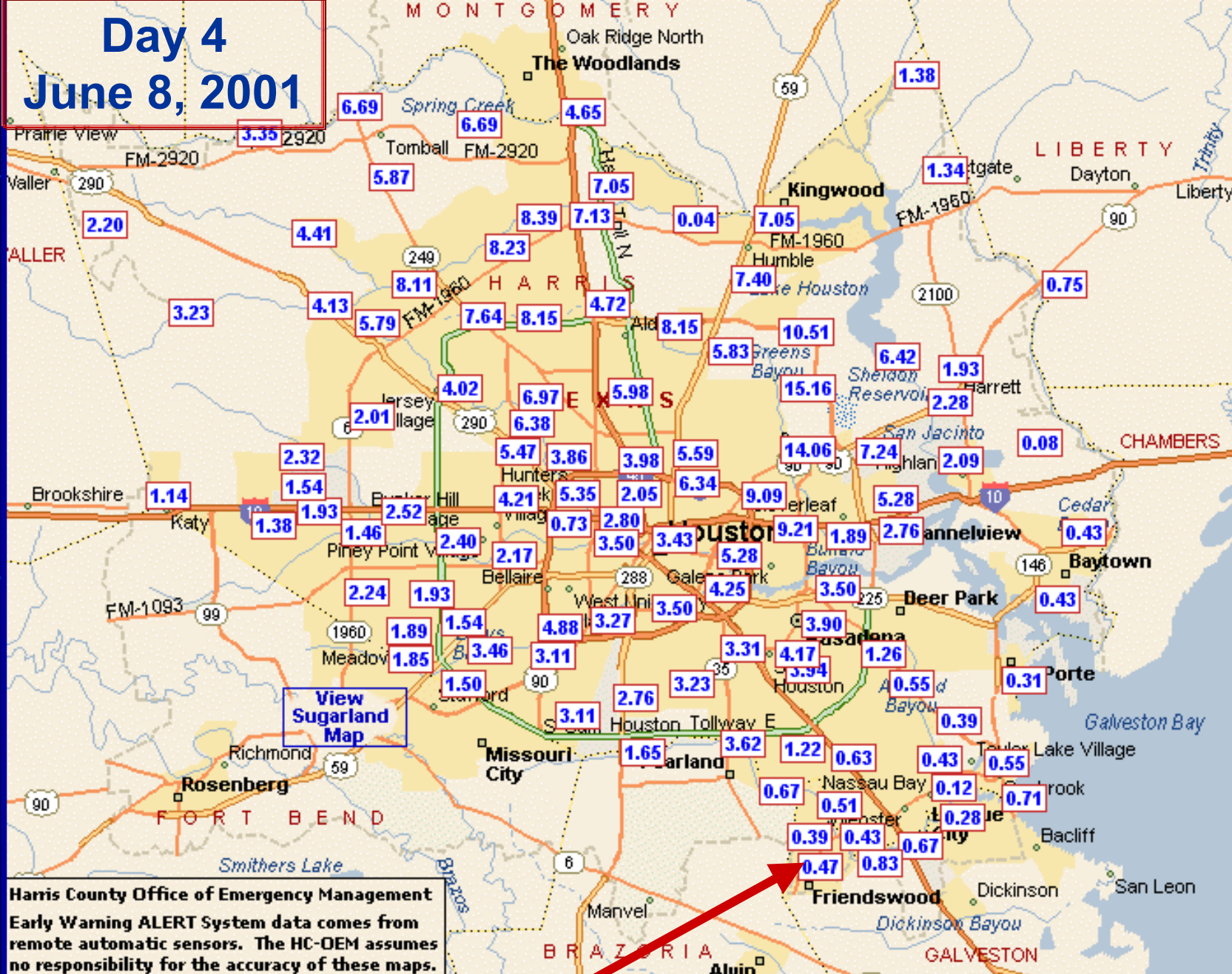
Harris County Office of Emergency Management
Early Warning ALERT System data comes from remote automatic sensors. The HC-DEM assumes no responsibility for the accuracy of these maps.

**Day 2
June 6, 2001**

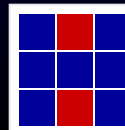
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The map displays water levels across Harris County, Texas, with various locations marked by numerical values in red boxes. Key locations include Spring Creek, Tomball, Humble, Houston, Baytown, and Deer Park. Major roads like FM-2920, FM-1960, and I-10 are shown. Water bodies such as Lake Houston, Greens Bayou, and Galveston Bay are labeled. A red arrow points to a link labeled "View Sugarland Map".

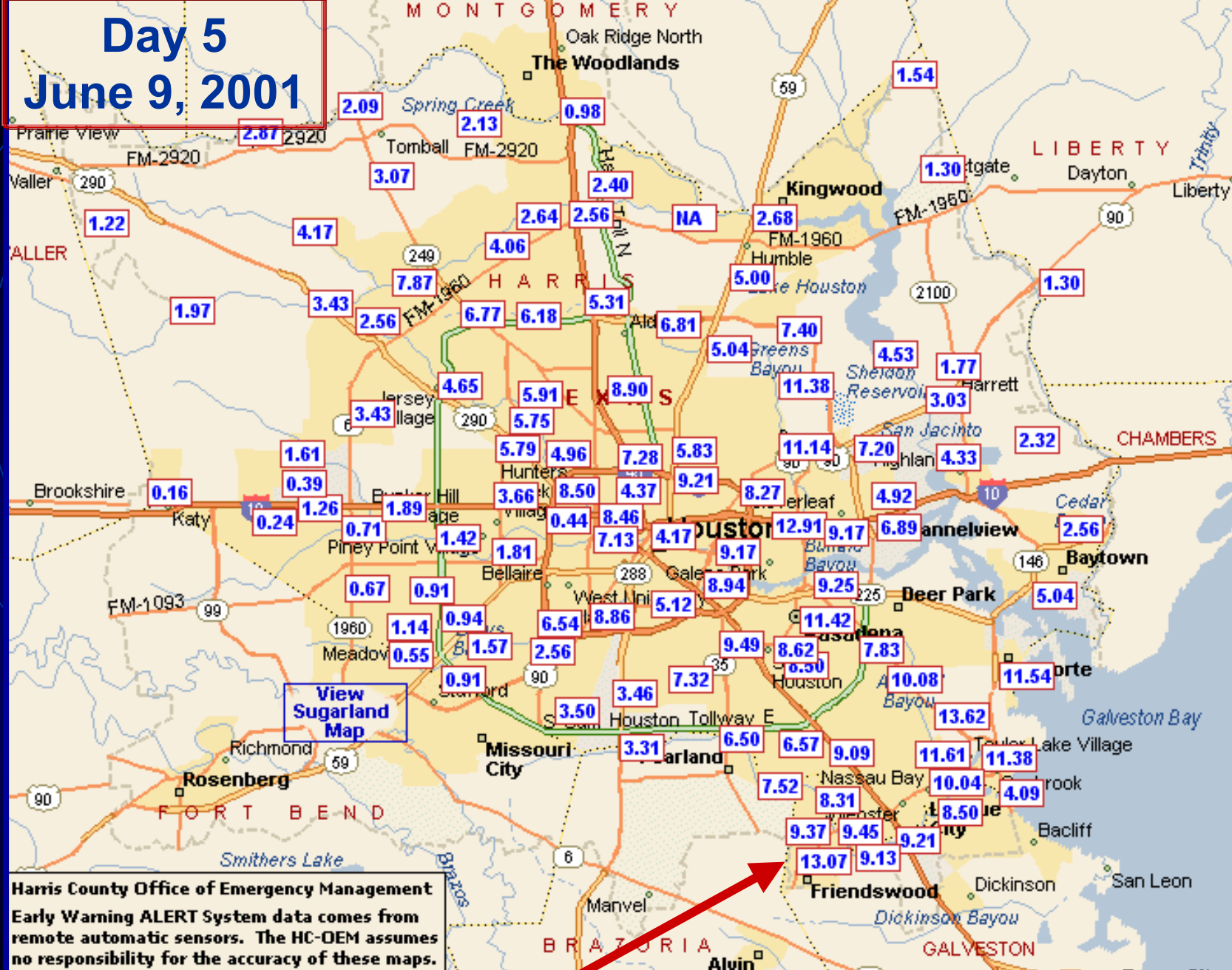
Day 4
June 8, 2001



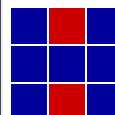
0.47" - Friendswood



Day 5
June 9, 2001



13.07" - Friendswood



26.02" Total Rainfall



Friendswood (Clear Creek)





**Greens Bayou, Home Owned Estates
6/10/01 pm**





**Halls Bayou, People at a store all night
6/9/01 am**





**US 59 @ Hazard Street Overpass
6/09/01**



Hunting Bayou, I-10 - 6/9/01 am





**Hunting Bayou, Holiday Forest
6/9/01 am**





**Hunting Bayou, Kashmere Gardens with
Downtown Skyline - 6/9/01 am**



**Hunting Bayou, Wastewater Treatment
Plant, North Loop - 6/9/01 am**





Hunting Bayou, Tank Farm - 6/9/01 am





**San Jacinto River, Forest Cove
6/9/01 am**





Buffalo Bayou Downtown Tunnel

6/09/01





Buffalo Bayou Downtown Tunnel

6/09/01





**Upper Sims Bayou, Meredith Manor
Subdivision - 6/9/01**





**White Oak Bayou, Looking Upstream
from W. 11th - 6/9/01 am**





**White Oak Bayou, Heights Blvd.
6/9/01 am**





**White Oak Bayou, I-45 and I-10 Interchange,
Downtown - 6/9/01 am**

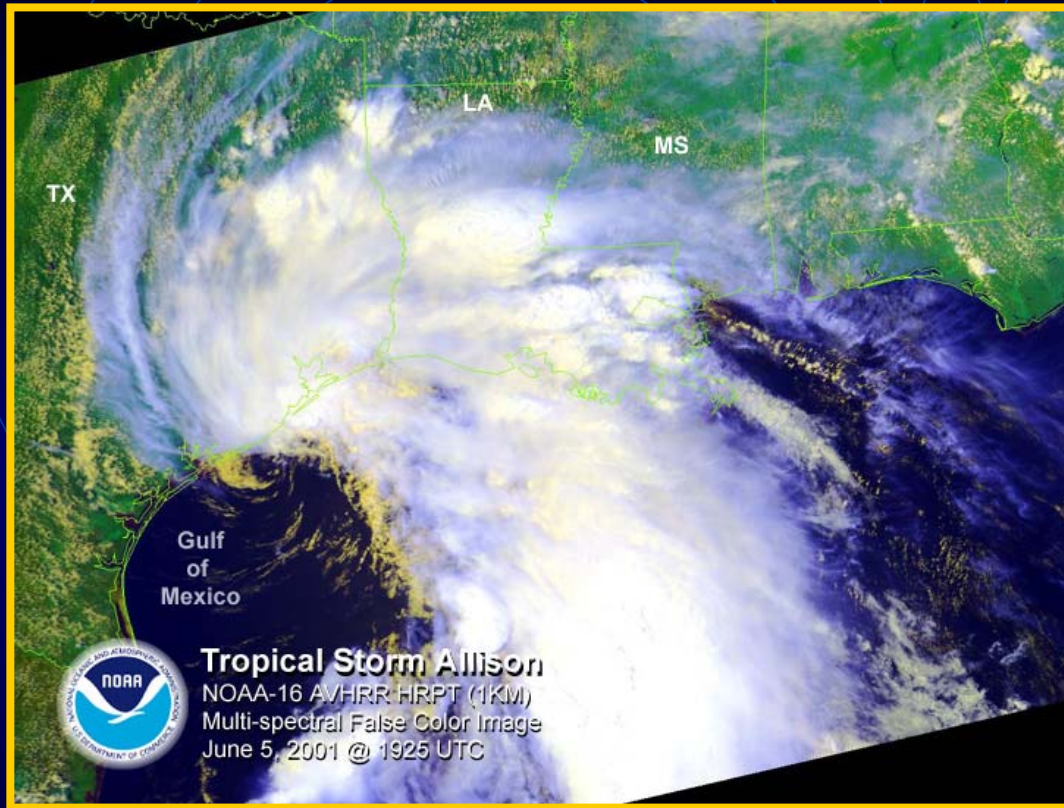


Did Not Flood!

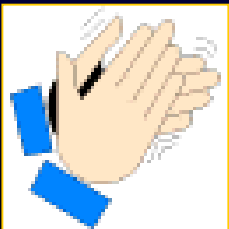


Island Inn

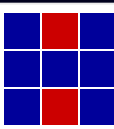
TROPICAL STORM ALLISON



Only 43 lives were lost during Tropical Storm Allison because of the Federal, State and Local Agencies, and Emergency Response Personnel, that risked their lives to warn, rescue and protect the Public.



This paper is a tribute to them.



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