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## Katrina - Scenario E: Modeling conditions

- I next modeled Hurricane Katrina to isolate and study the incremental impact on flooding at each Trial Property of all federally funded flood protection and navigation works in and around St. Bernard Polder.
- This Scenario is a modified version of Scenario D in which the federal levees and the MRGO are both eliminated from the landscape.
- Specifically, Scenario E incorporates modified topography, bathymetry and Manning's  $n$  friction coefficients reflecting:
  - The elimination of the MRGO channel.
  - The 1956 wetland conditions, including increased density in the areas of Caernarvon Marsh, the Golden Triangle Marsh, La Loutre Ridge, and the Central Wetlands.
  - The 1958 pre-MRGO configuration of the Gulf Inter-Coastal Waterway (“GIWW”) channel.
  - The elimination of dredged mounds along the MRGO that were created during the dredging process.
  - The elimination of the federal levees.

- The following table compares the relevant differences in modeling conditions for Scenarios A1, A2, B1, B2, C, D, and E.

Scenario	MRGO Status	Marsh Status	Levee Breaches	Description
<b>A1 (Katrina Actual Event Conditions)</b>	<b>2005 pre-Katrina dimensions</b>	<b>2005 pre-Katrina conditions</b>	<b>Breaching occurring as during Katrina</b>	<b>Base case: Actual Katrina Hindcast</b>
<b>A2 (2005 MRGO/ 2005 Wetlands/ IHNC Breaches Only)</b>	2005 pre-Katrina dimensions	2005 pre-Katrina conditions	IHNC Breaches Only	Base case reflecting levee breaches only in the IHNC floodwall
<b>B1 (MRGO As-Designed/1956 Wetlands)</b>	MRGO at its authorized dimensions as of completion in 1968	1956 Wetland conditions	Breaching occurring as during Katrina	Katrina impact absent bank erosion channel widening/ wetland degradation
<b>B2 (MRGO As-Designed/1956 Wetlands/IHNC Breaches Only)</b>	MRGO at its authorized dimensions as of completion in 1968	1956 Wetland conditions	IHNC Breaches Only	Katrina impact absent bank erosion channel widening/ wetland degradation reflecting IHNC breaches only
<b>C (No MRGO/ 1956 Wetlands)</b>	No MRGO	1956 Wetland conditions	Breaching occurring as during Katrina	Katrina impact without MRGO, and with 1956 wetland topography
<b>D (No Federal Levees/2005 MRGO/2005 Wetlands)</b>	2005 pre-Katrina dimensions	2005 pre-Katrina conditions	No levees along MRGO Reach 1 and 2	Katrina impact with MRGO but without levees along MRGO. MRGO and wetlands with 2005 conditions
<b>E (No Federal Levees/No MRGO/1956 Wetlands)</b>	<b>No MRGO</b>	<b>1956 Wetland conditions</b>	<b>No levees along MRGO Reach 1 and 2</b>	<b>Katrina impact with no federal influence</b>

Table 15

## Katrina - Scenario E: Flooding in St. Bernard Parish

- Scenario E, which eliminates the MRGO, and models the wetlands in their 1956 conditions, but eliminates the federal levees, results in flooding very similar to Scenario D.
- Compared to Scenario A1, there is 0.6 to 0.8 ft less water along the southern portion of MRGO Reach 2, 0.2 ft more water in the eastern portion of the GIWW, 1.2 ft less water in the central portions of the IHNC, and between 3 and 5 ft more water in St. Bernard Polder.
- As in Scenario D, there is less water along the southern portion of MRGO Reach 2 because more water moves into the Polder.
- More water develops in the GIWW because water now moves unimpeded between the Polder and the GIWW.
- There is less water in the central portion of the IHNC because the hydraulic connectivity to that point has still been reduced.
- Ultimately, greater flooding develops within the Polder because it travels unimpeded from Lake Borgne and the GIWW into the Central Wetlands and over the 40 Arpent levee into the populated areas of the Polder.
- The Trial Property located outside the federal levee system is unaffected, and floods to the same extent as in Scenario A1.

## **Katrina - Scenario E: Flooding in St. Bernard Parish**

- The following slides, Figures 48a-q, show the evolution of flooding inside St. Bernard Parish in Scenario E.
- Without the federal levees, the Central Wetlands were easily overwhelmed as water moved in from Lake Borgne.
- The 40 Arpent levee and the levees protecting Poydras, LA and St. Bernard, LA were subsequently easily overtopped and the interior protected areas were flooded.
- In this Scenario, the entire Polder is inundated by Hurricane Katrina storm surge waters as high as 16 ft by 10:00 am CDT on August 29, 2005.
- The existence of the MRGO and the conditions of the surrounding wetlands - the two variables changed from Scenario D - had a negligible impact on the flooding that takes place in Scenario E.

8/29/2005 at 2 am CDT

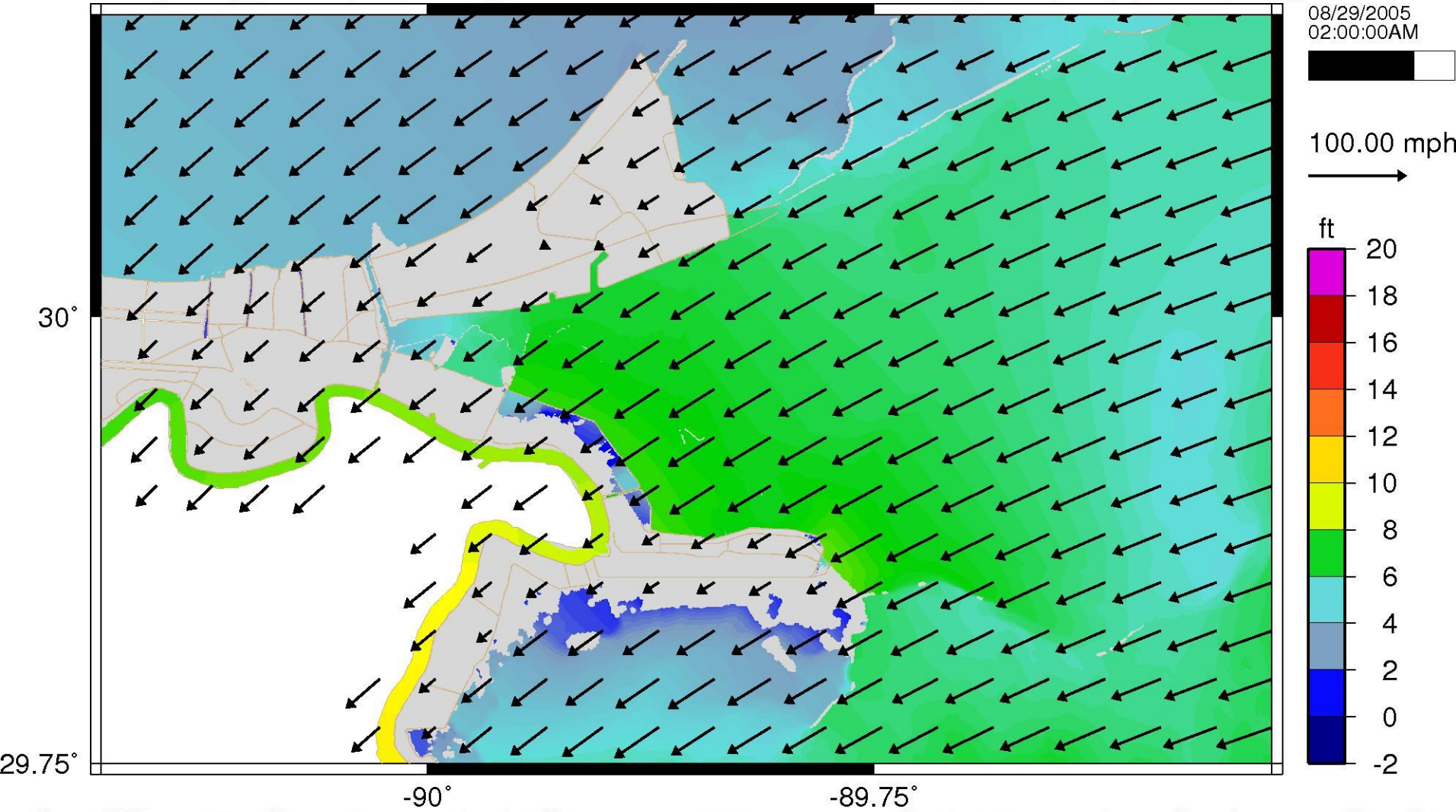


Figure 48a

8/29/2005 at 4 am CDT

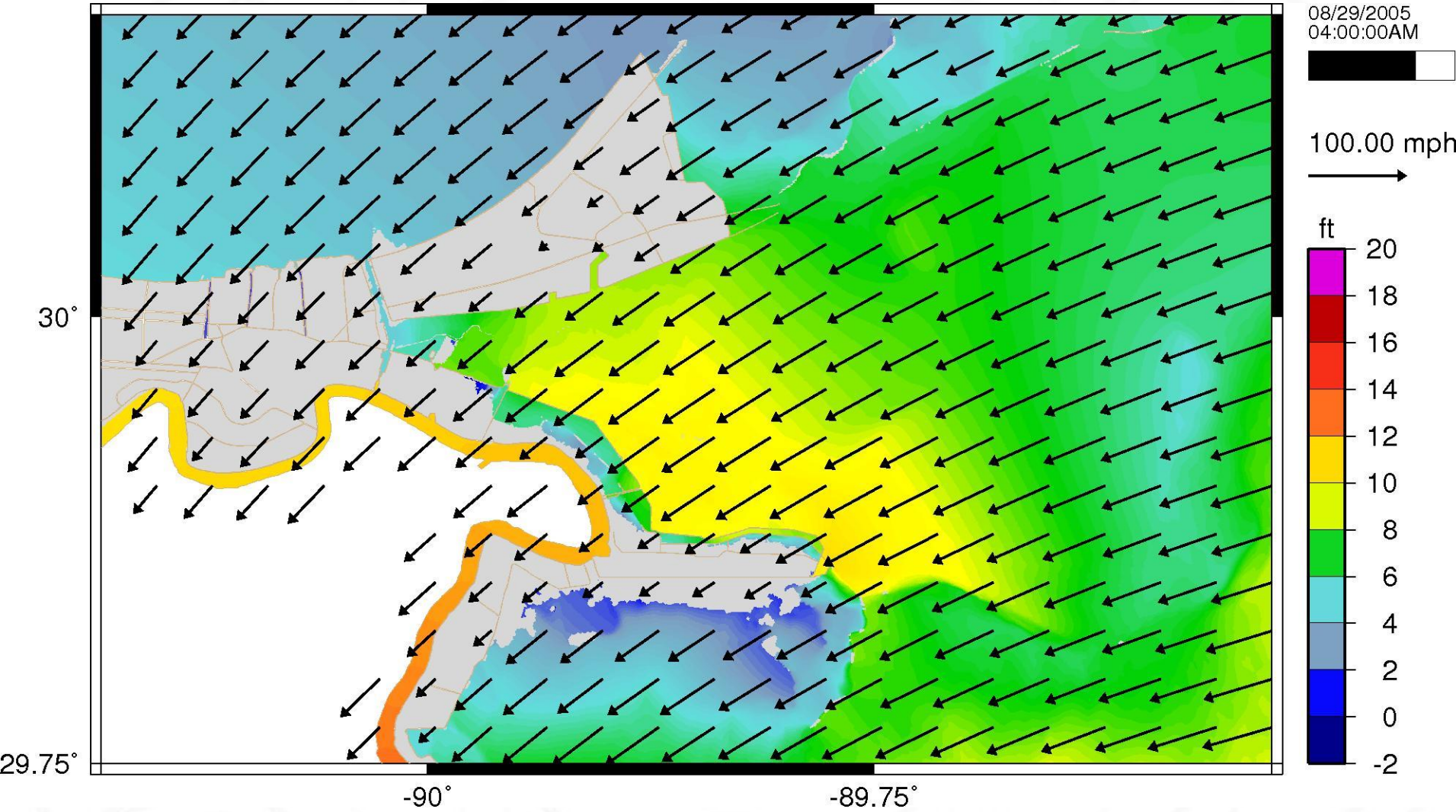


Figure 48b

8/29/2005 at 6 am CDT

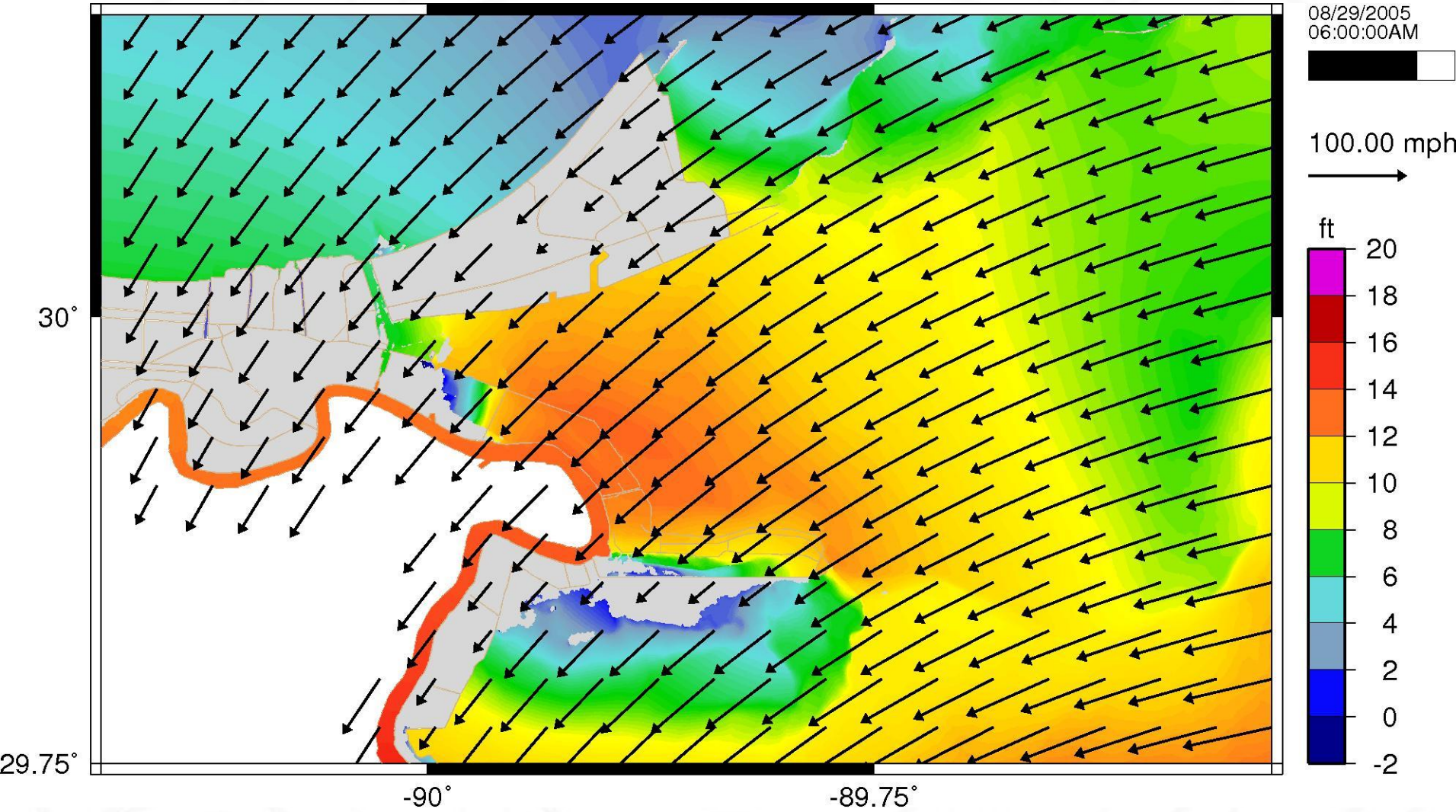


Figure 48c



8/29/2005 at 7 am CDT

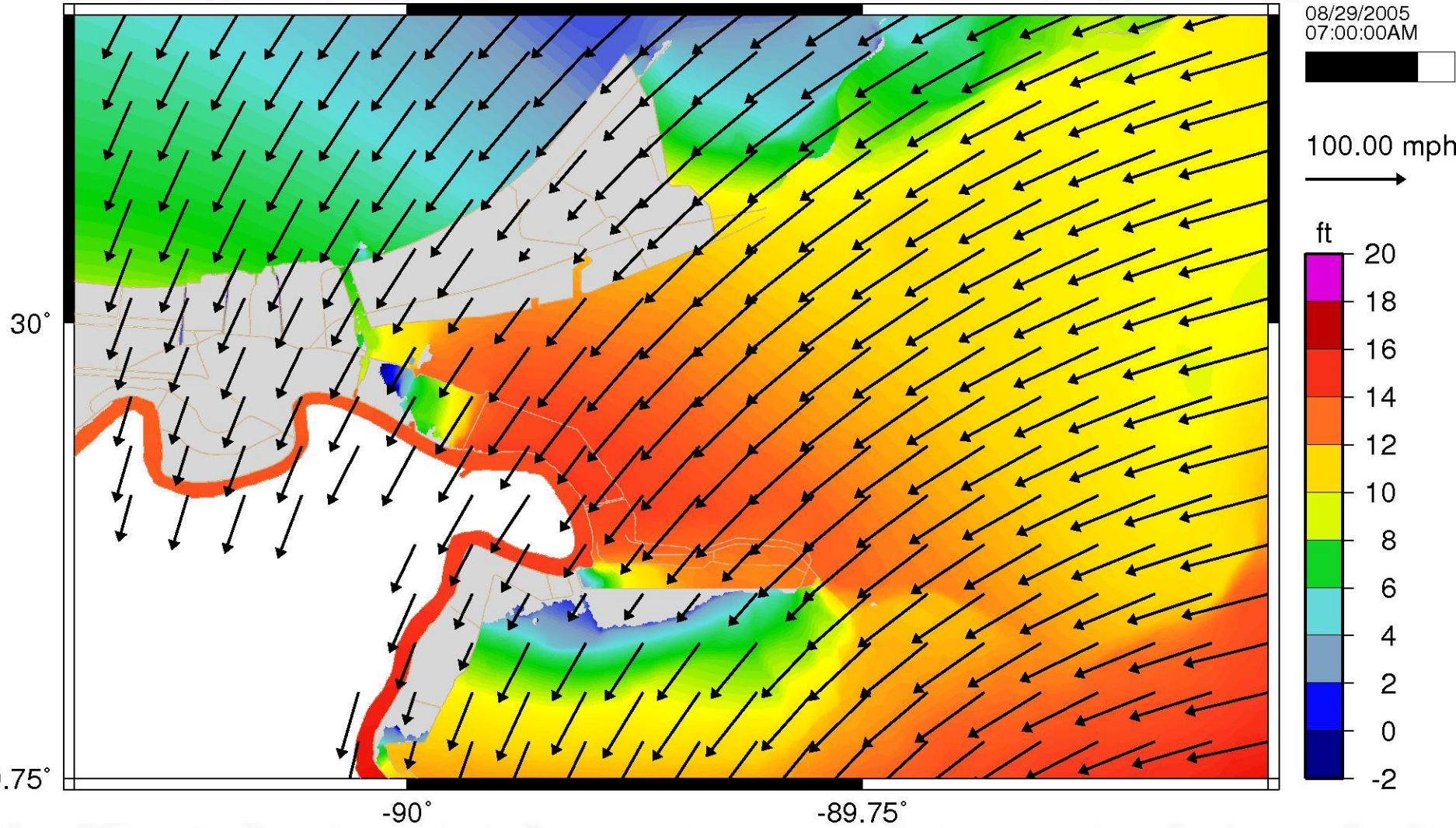


Figure 48d

8/29/2005 at 8 am CDT

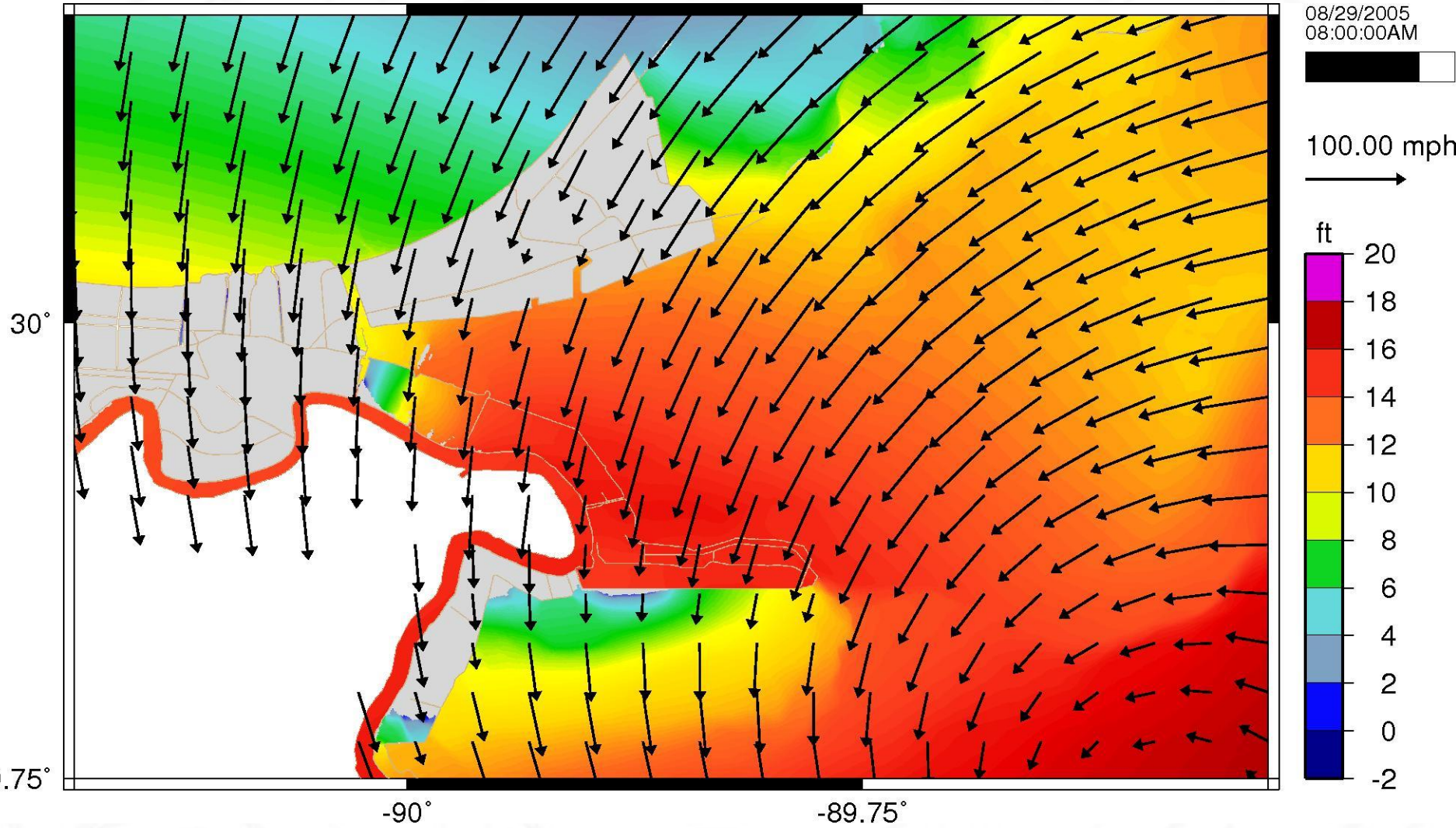


Figure 48e

8/29/2005 at 9 am CDT

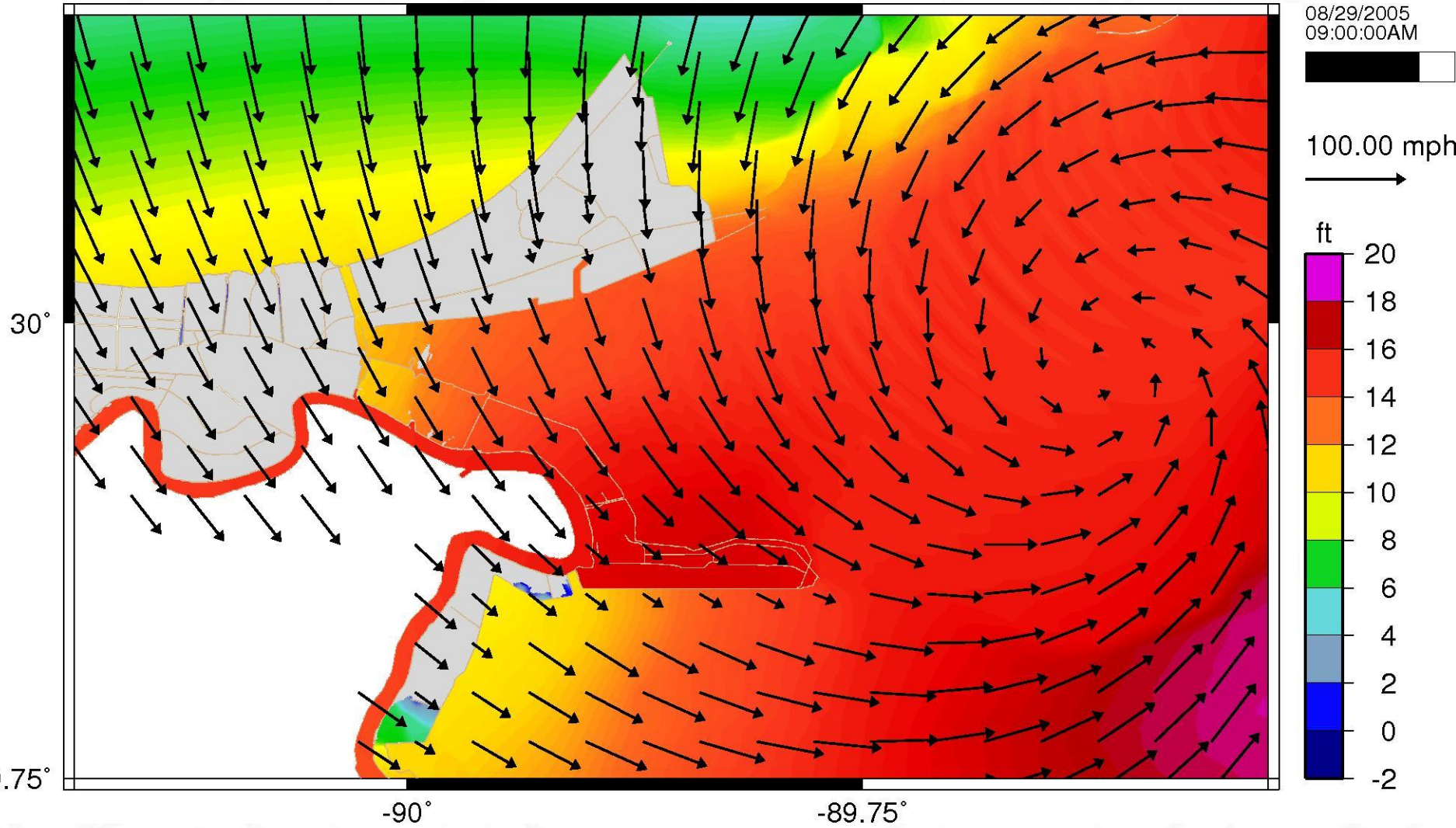


Figure 48f

8/29/2005 at 10 am CDT

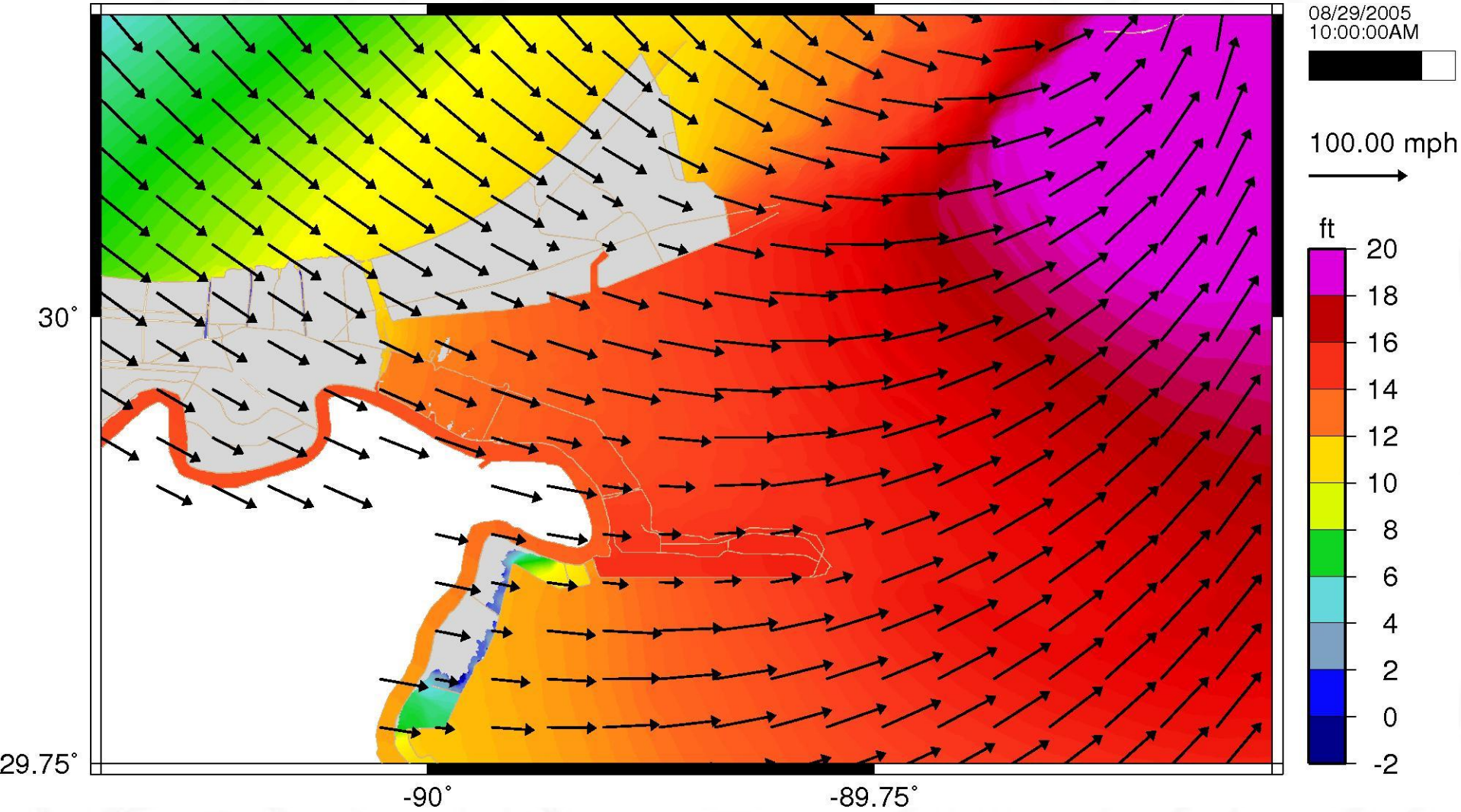


Figure 48g

8/29/2005 at 11 am CDT

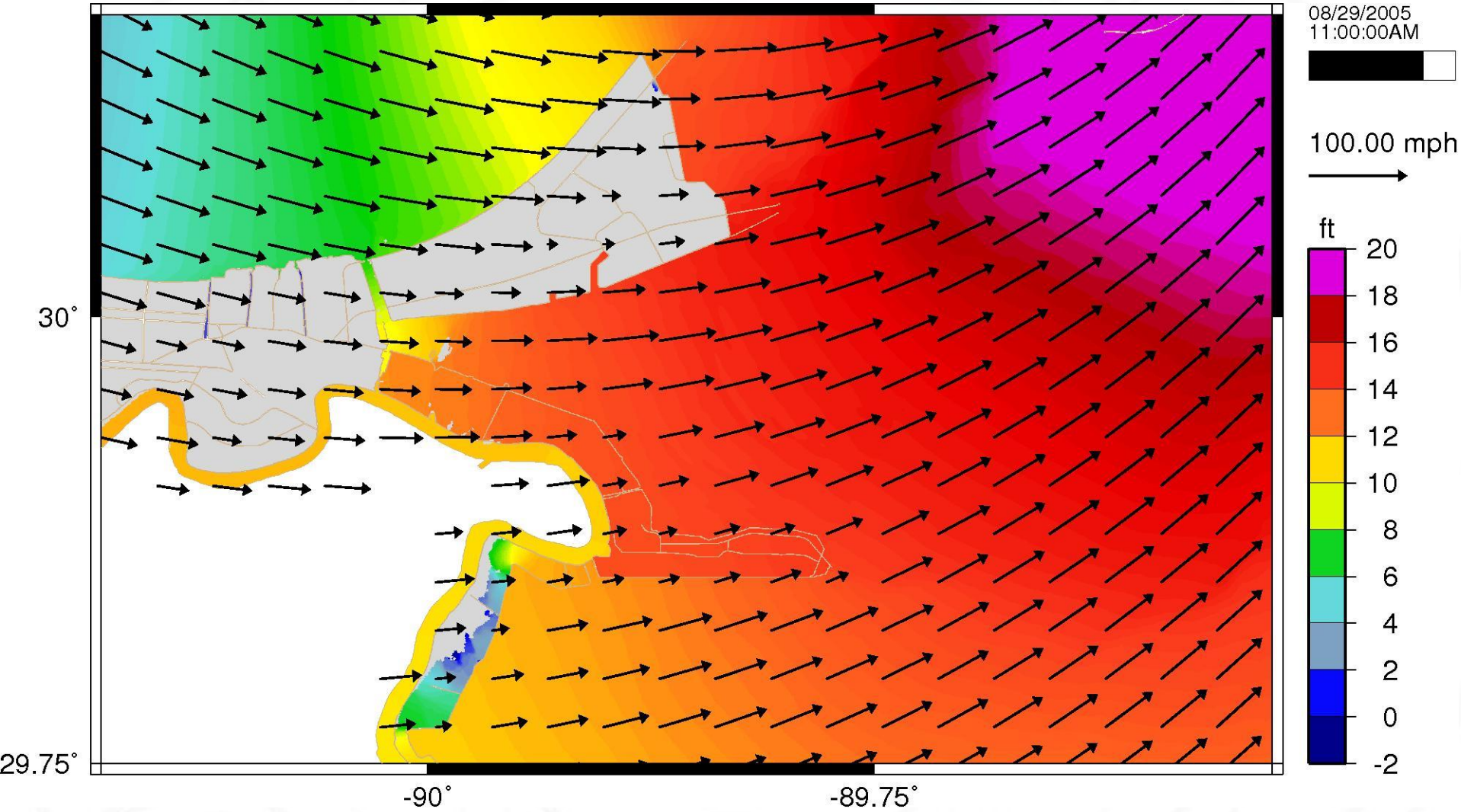


Figure 48h

8/29/2005 at 12 pm CDT

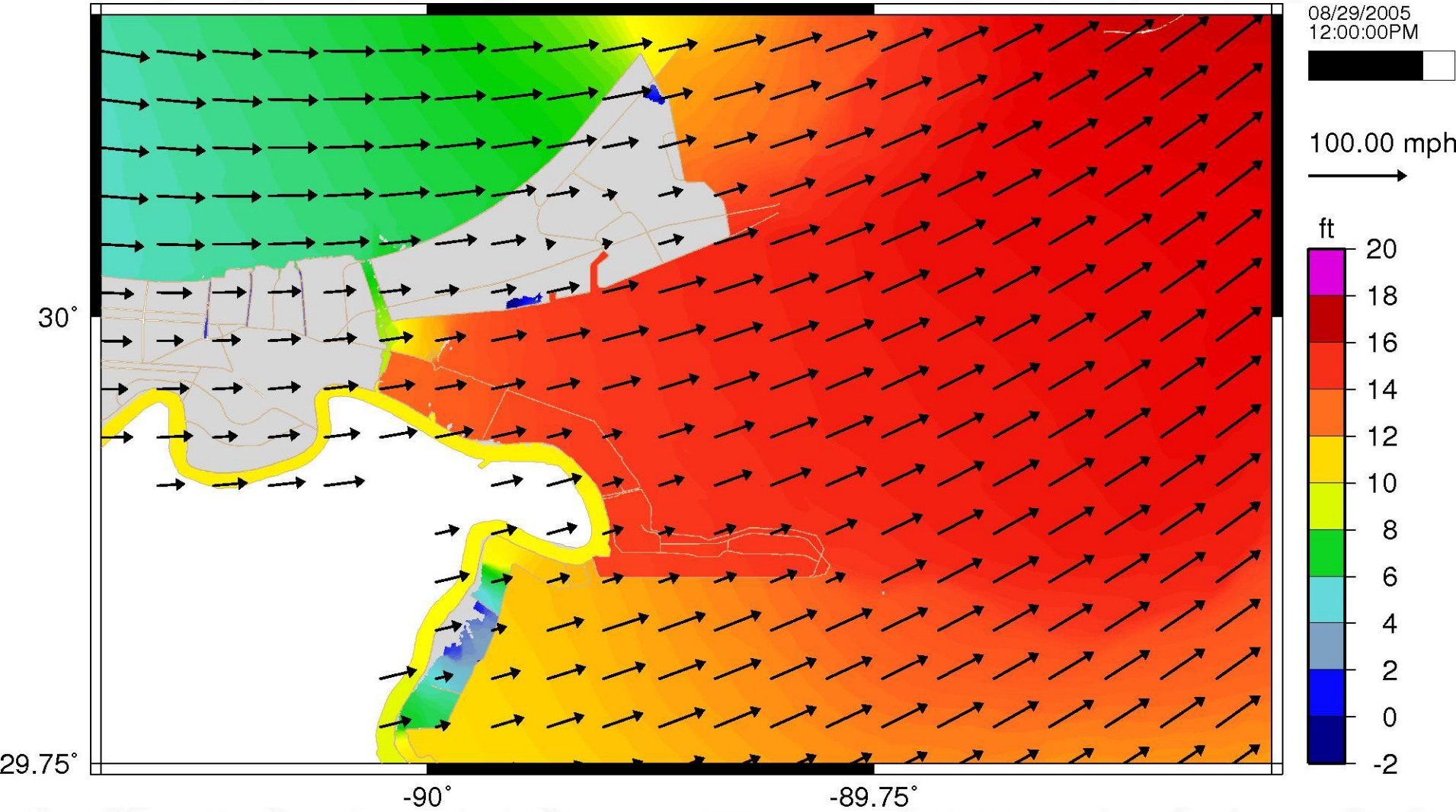


Figure 48i

8/29/2005 at 1 pm CDT

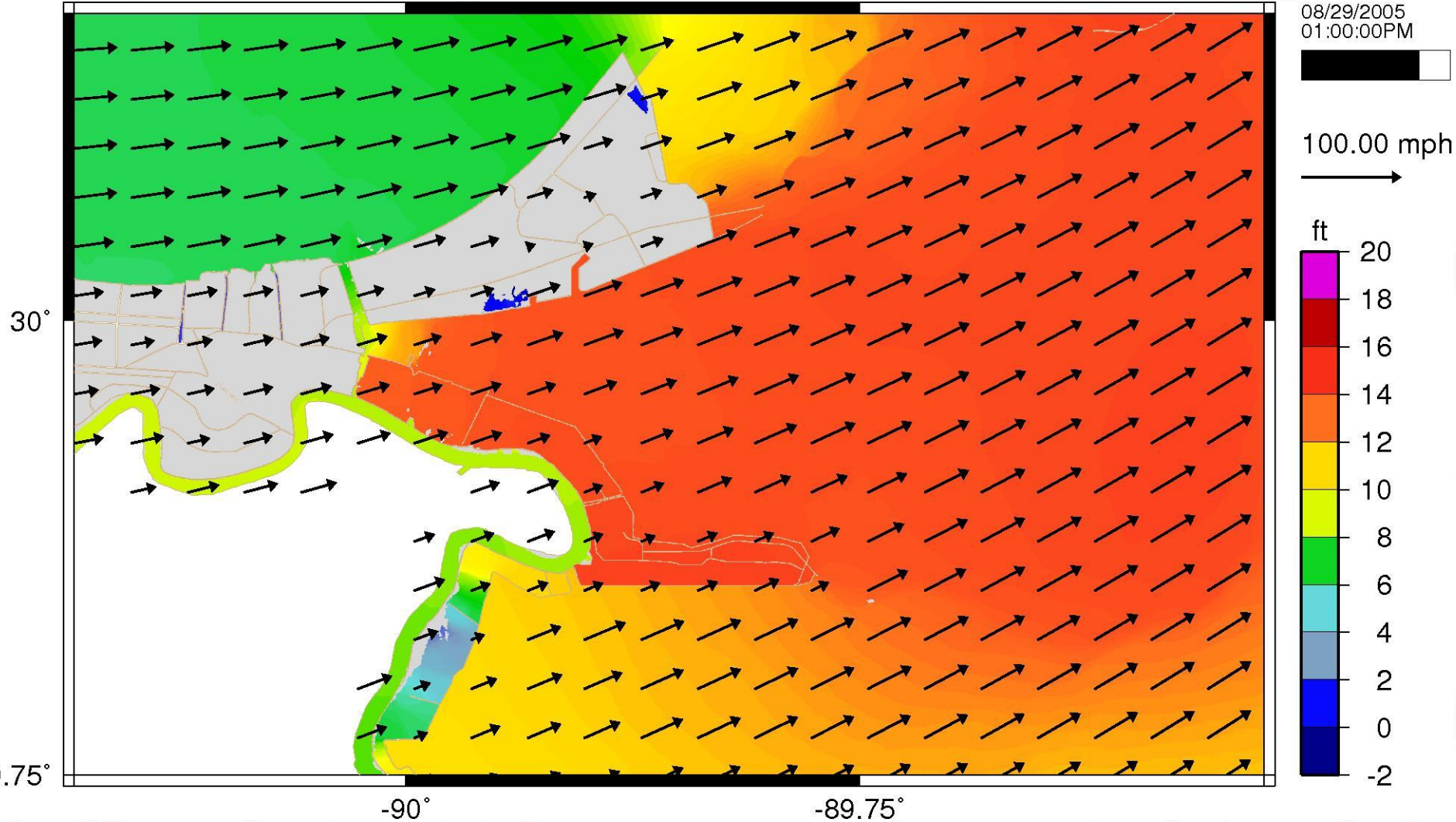


Figure 48j

8/29/2005 at 2 pm CDT

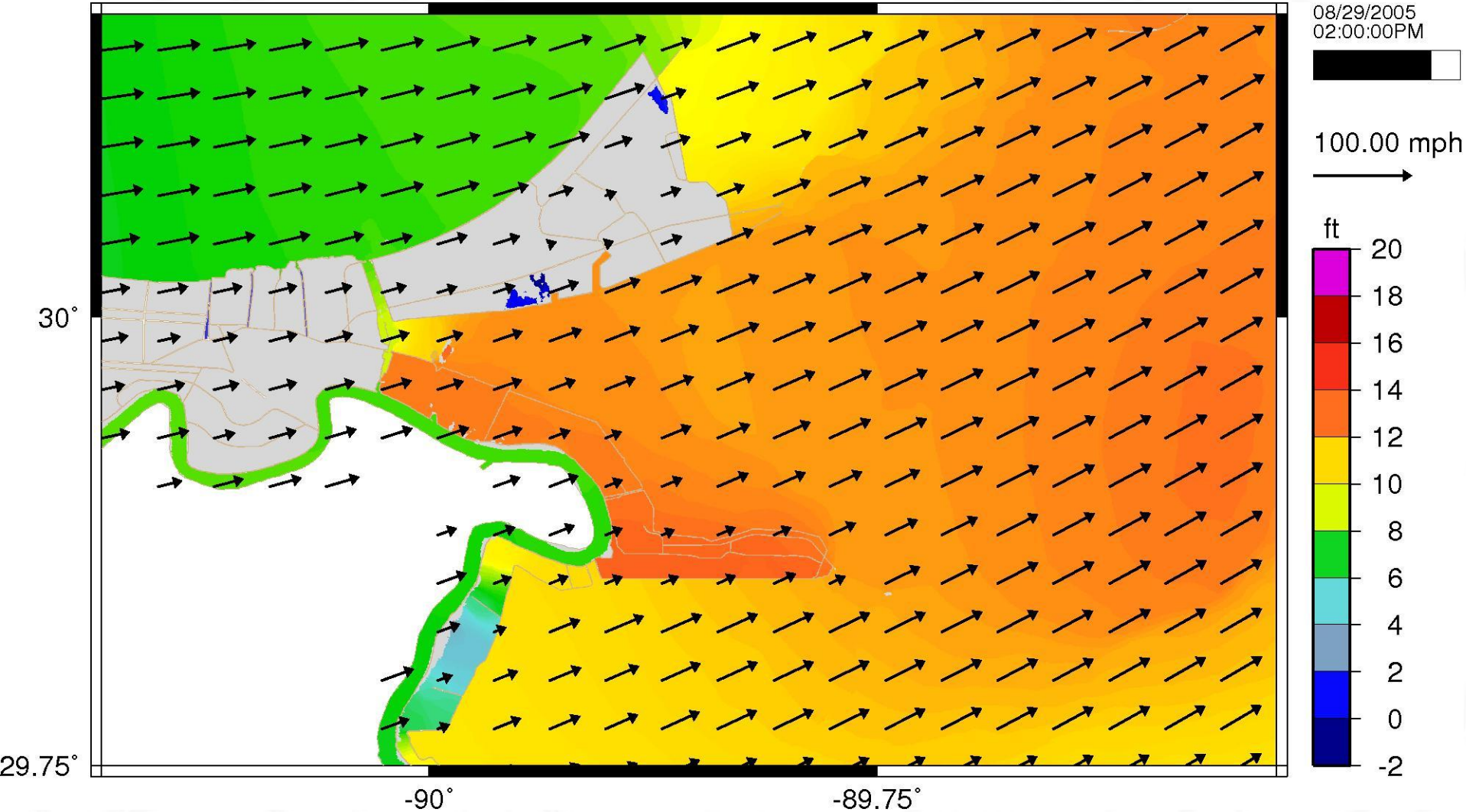


Figure 48k



8/29/2005 at 3 pm CDT

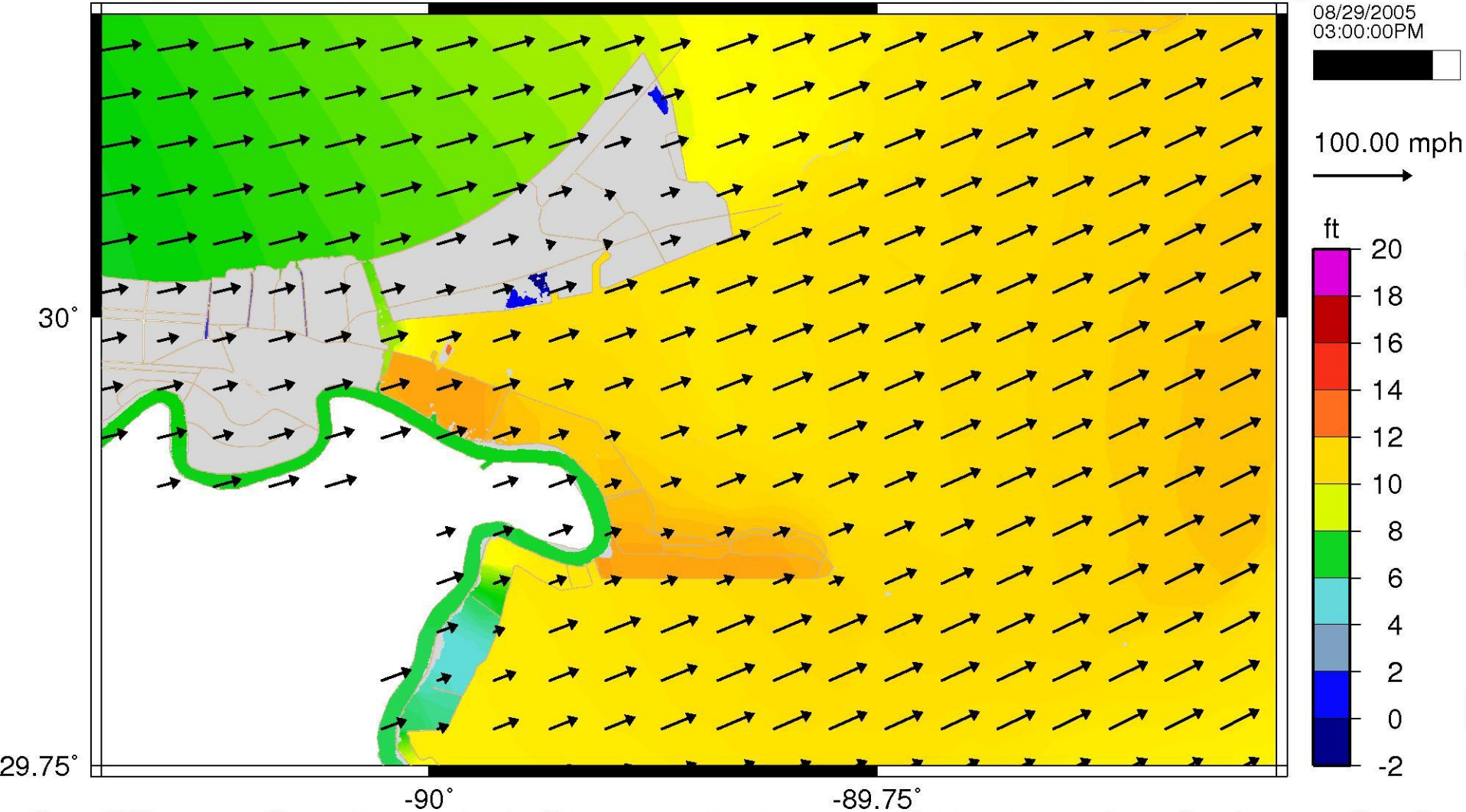


Figure 48I

8/29/2005 at 4 pm CDT

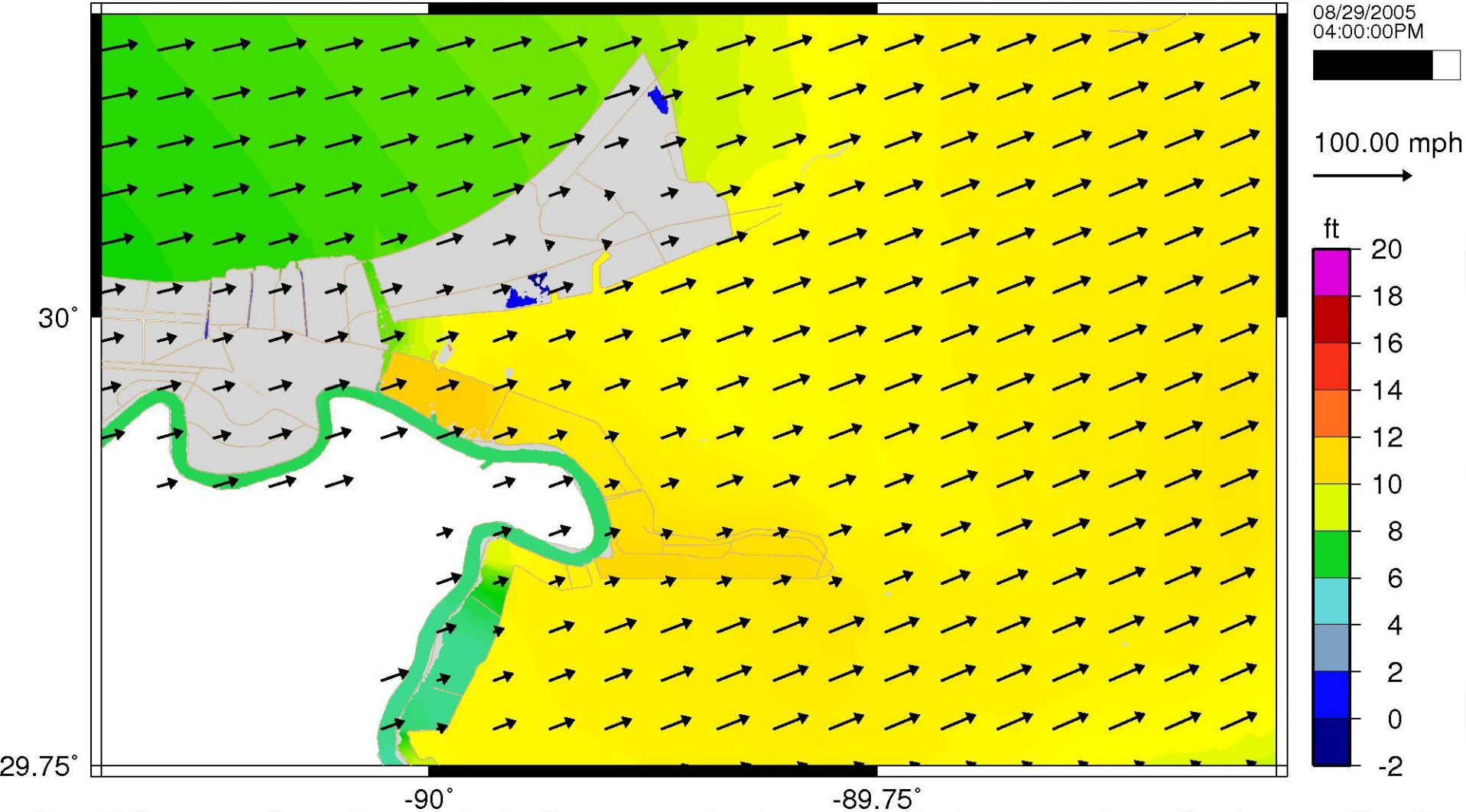


Figure 48m

8/29/2005 at 6 pm CDT

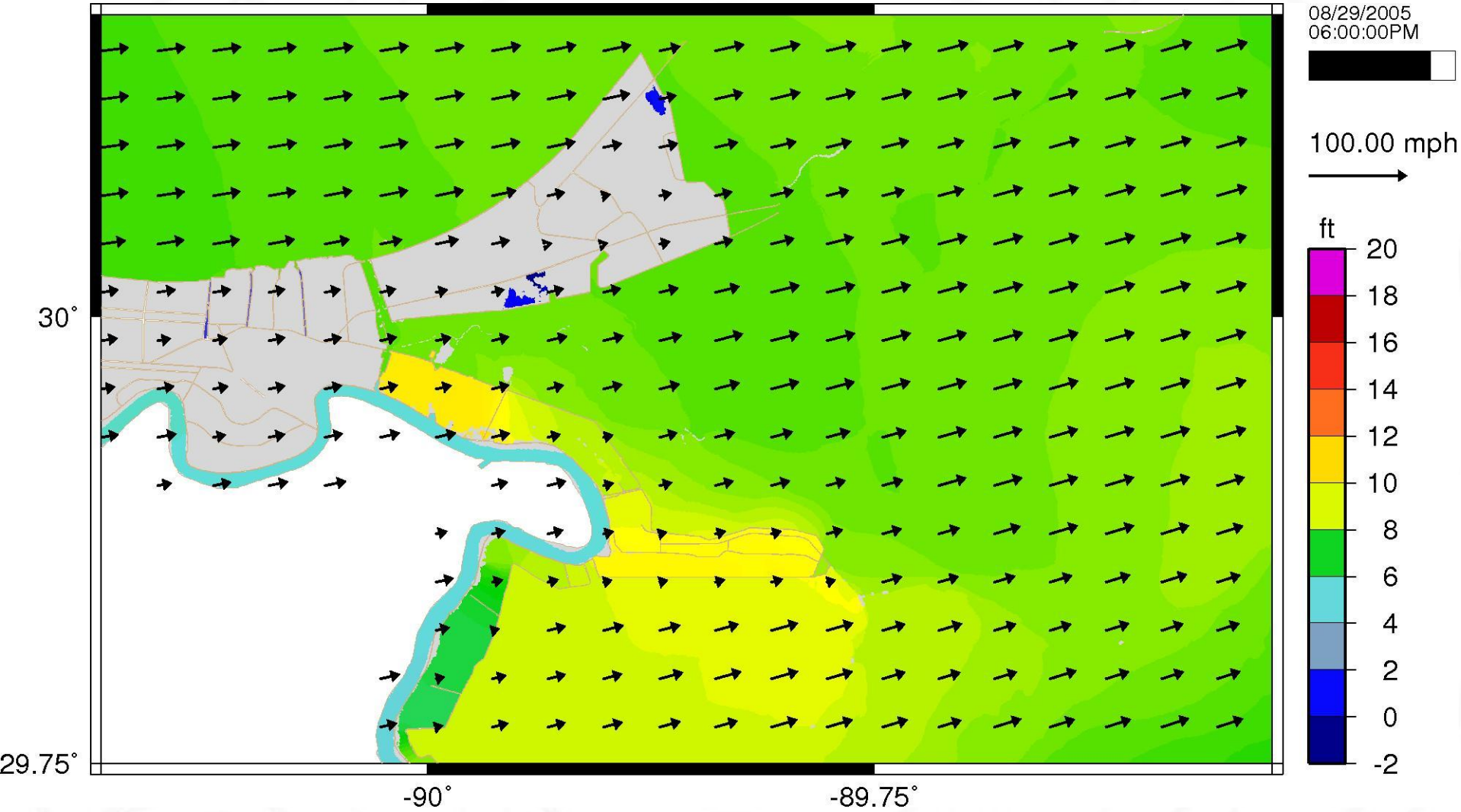


Figure 48n

8/29/2005 at 8 pm CDT

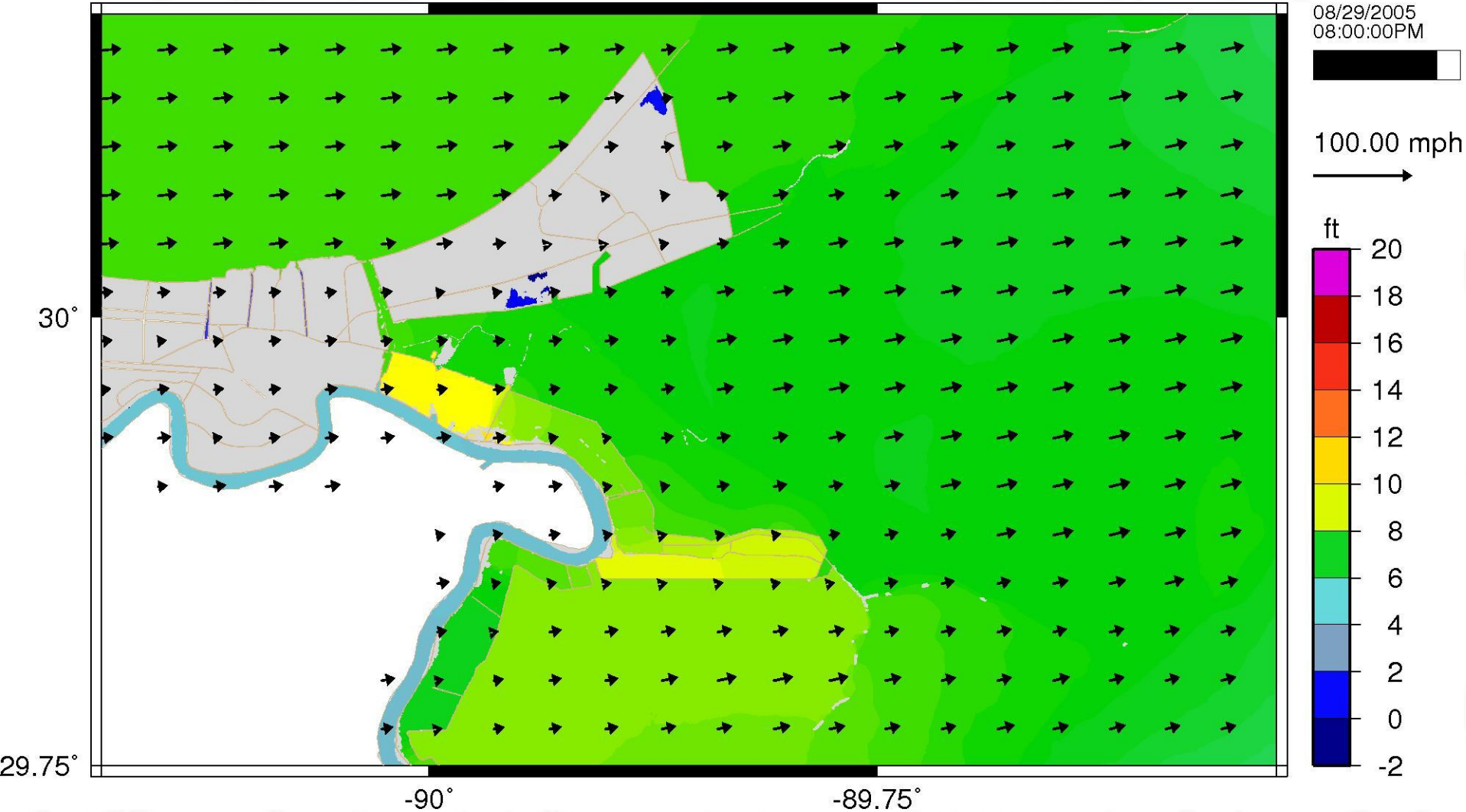


Figure 48o

8/29/2005 at 10 pm CDT

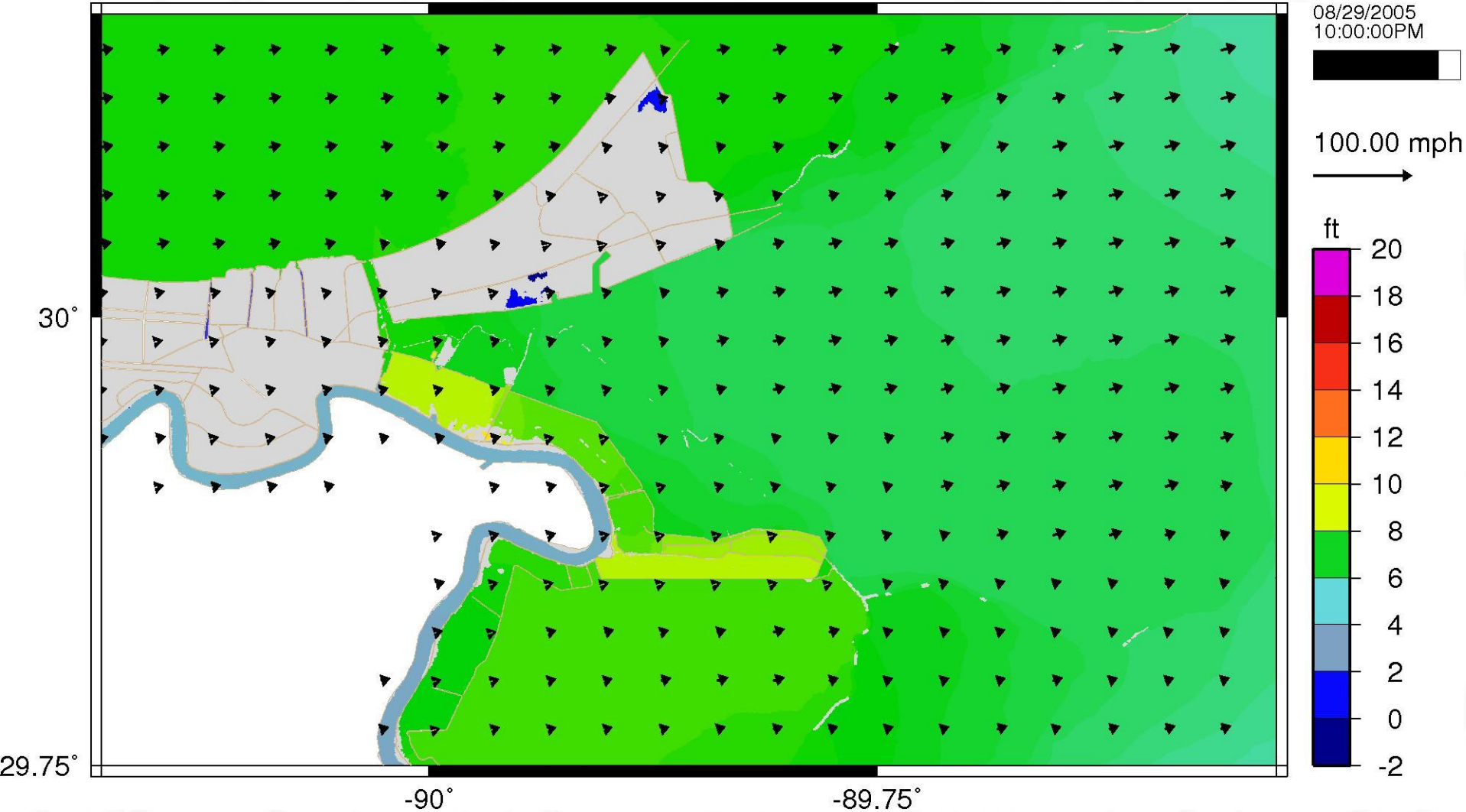


Figure 48p

8/30/2005 at 12 am CDT

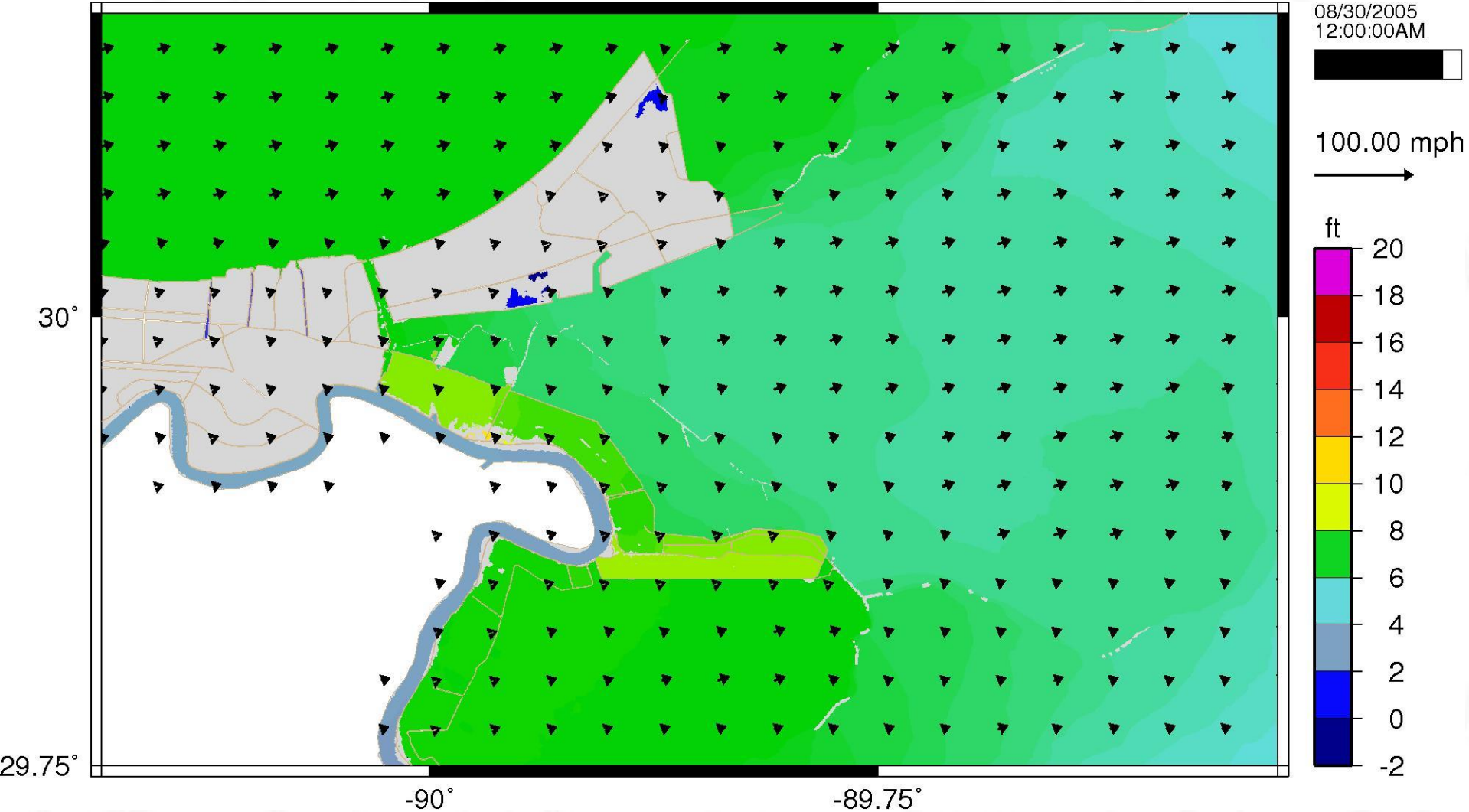


Figure 48q

## **Katrina - Scenario E: Flooding in St. Bernard Parish**

- The following slides, Figures 49-51, depict the differences between the flooding in the *No Federal Levees/No MRGO/1956 Wetlands* Scenario E and the flooding that actually took place during Hurricane Katrina.
- Flooding is greater throughout most of the Polder in Scenario E, and substantially greater in the easternmost portions of the Polder that would otherwise lie within the federal levee system. Flooding is somewhat diminished relative to Scenario A1 in the westernmost portion of the Lower Ninth Ward.

### Maximum E

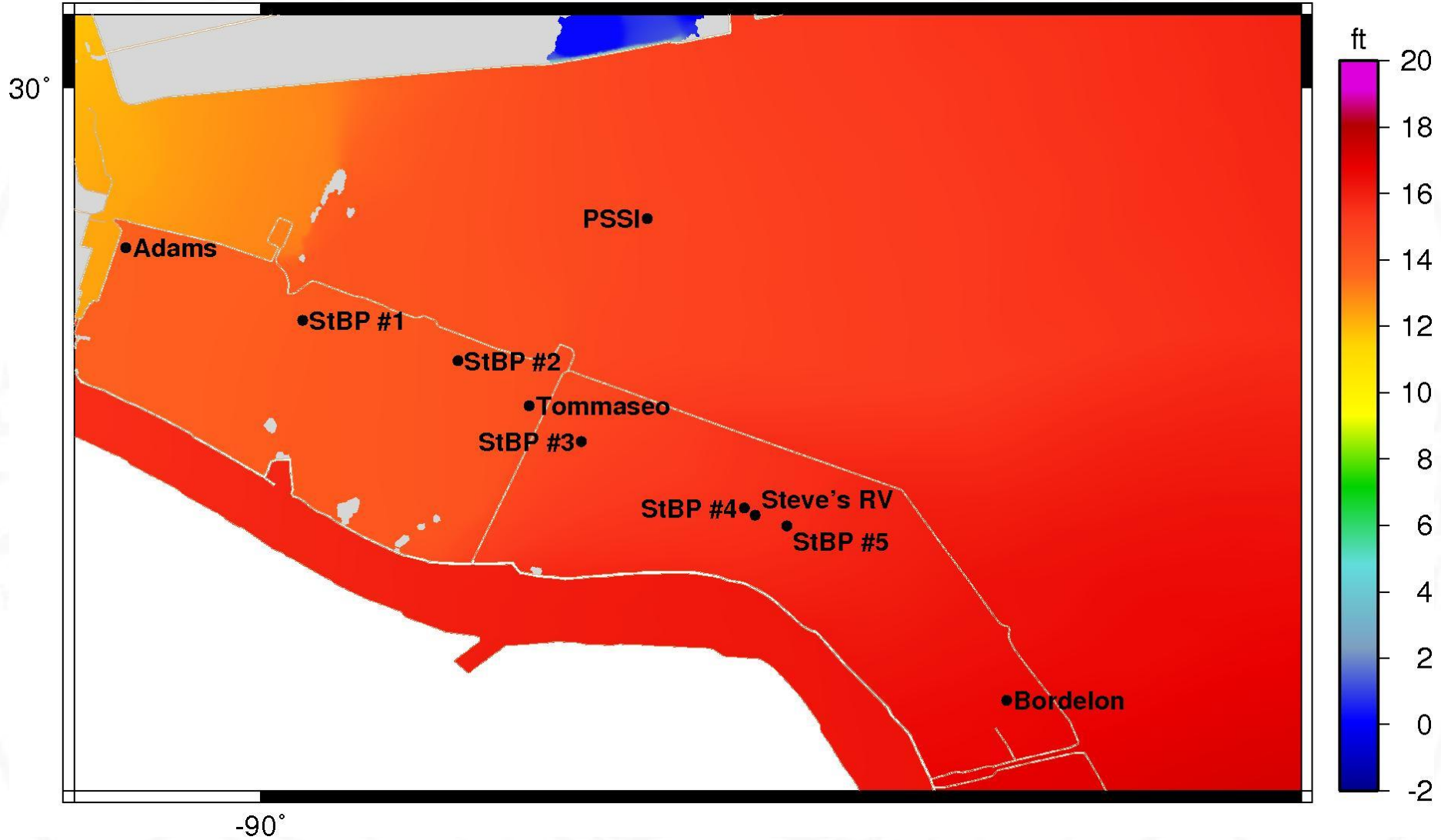


Figure 49



### Maximum A1

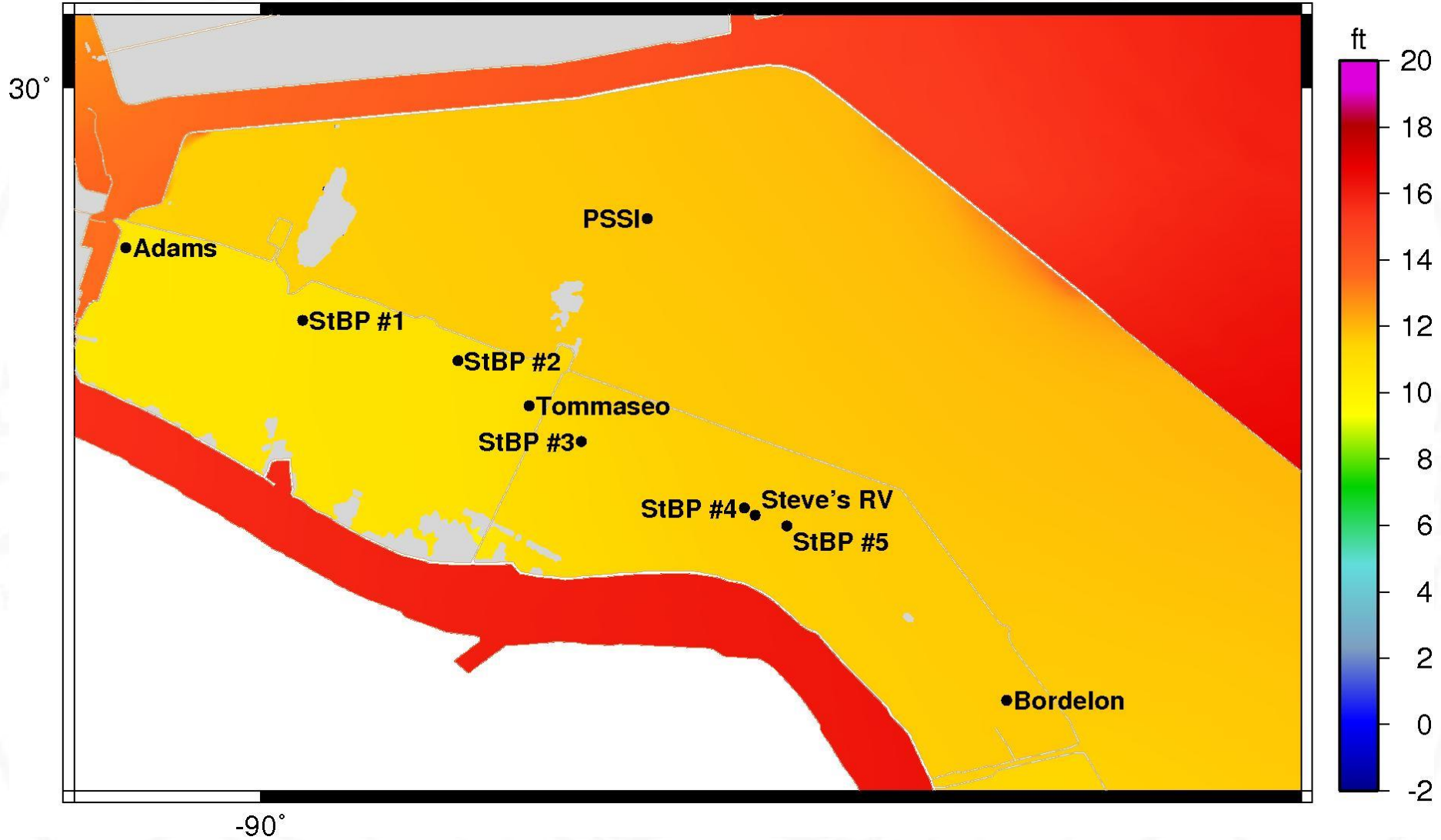


Figure 50

## Maximum A1 less Maximum E

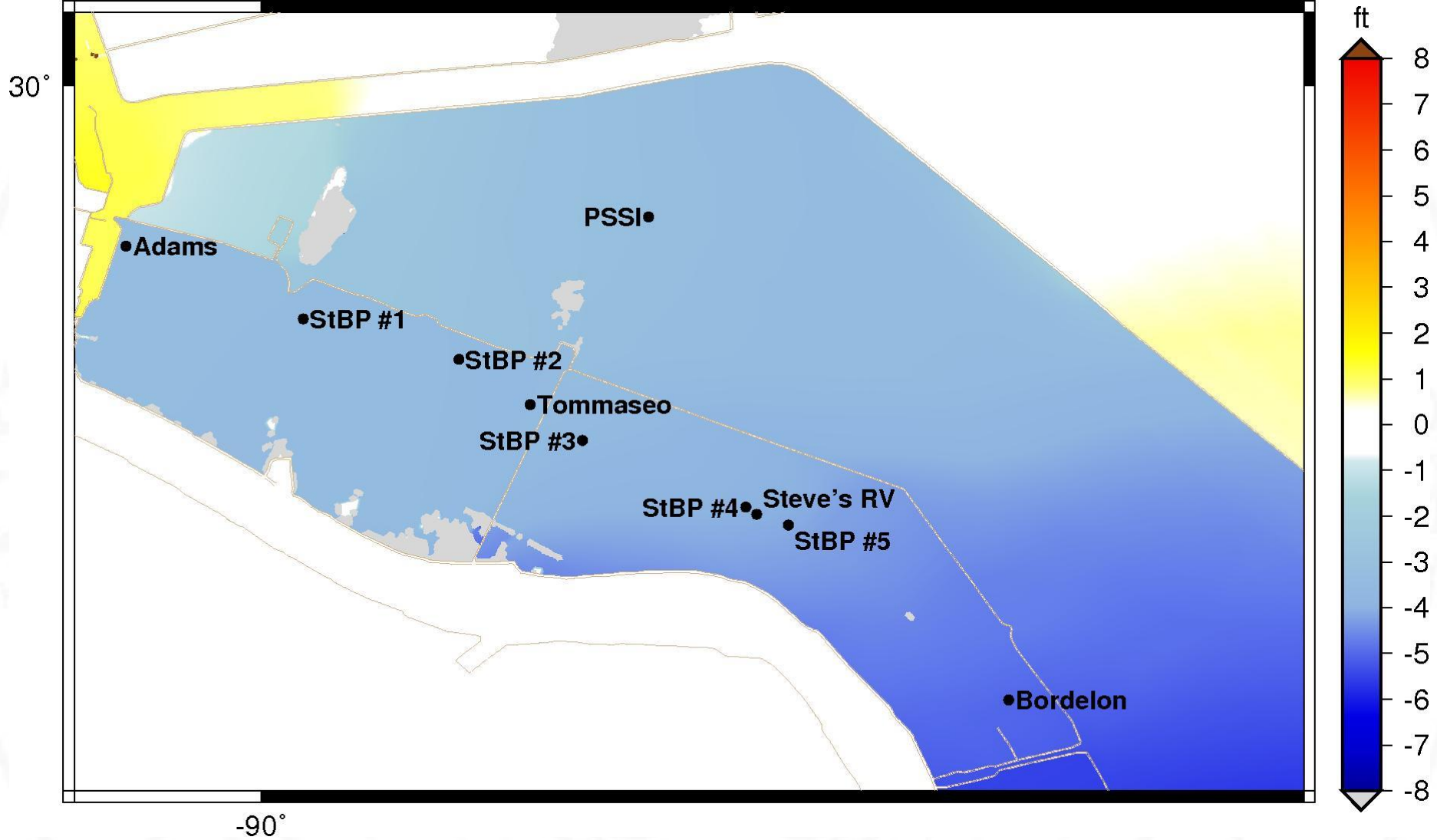


Figure 51

## **Katrina - Scenario E: Interior water surface time series at Plaintiff**

### **Properties**

- The following hydrographs, Figures 52a-k, depict the maximum flood elevations and the timing of the flooding at each Trial Property in Scenarios A1 (red), A2 (green), B1 (dark blue), B2 (pink), C (black), D (light blue), and E (dotted orange).
- The hydrographs also indicate the geographic location of each Trial Property inside the Polder.

# Katrina - Scenario E: Interior water surface time series at Plaintiff Properties

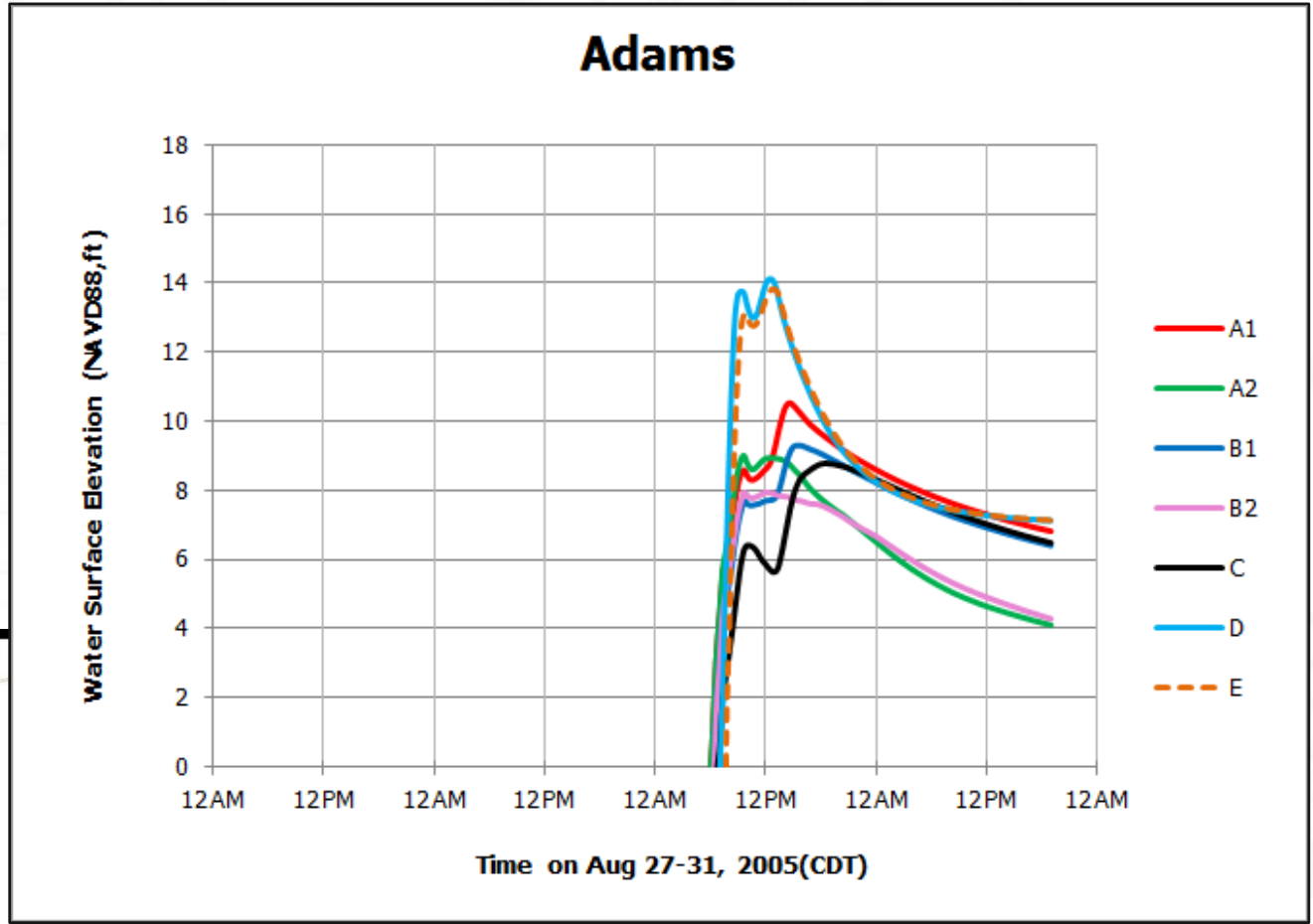
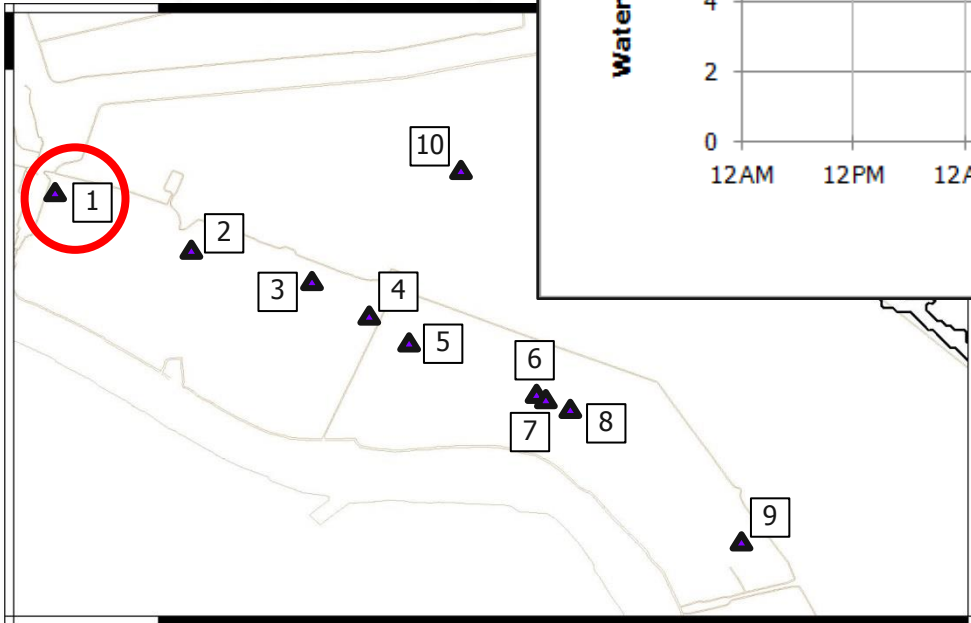


Figure 52a



# Katrina - Scenario E: Interior water surface time series at Plaintiff Properties

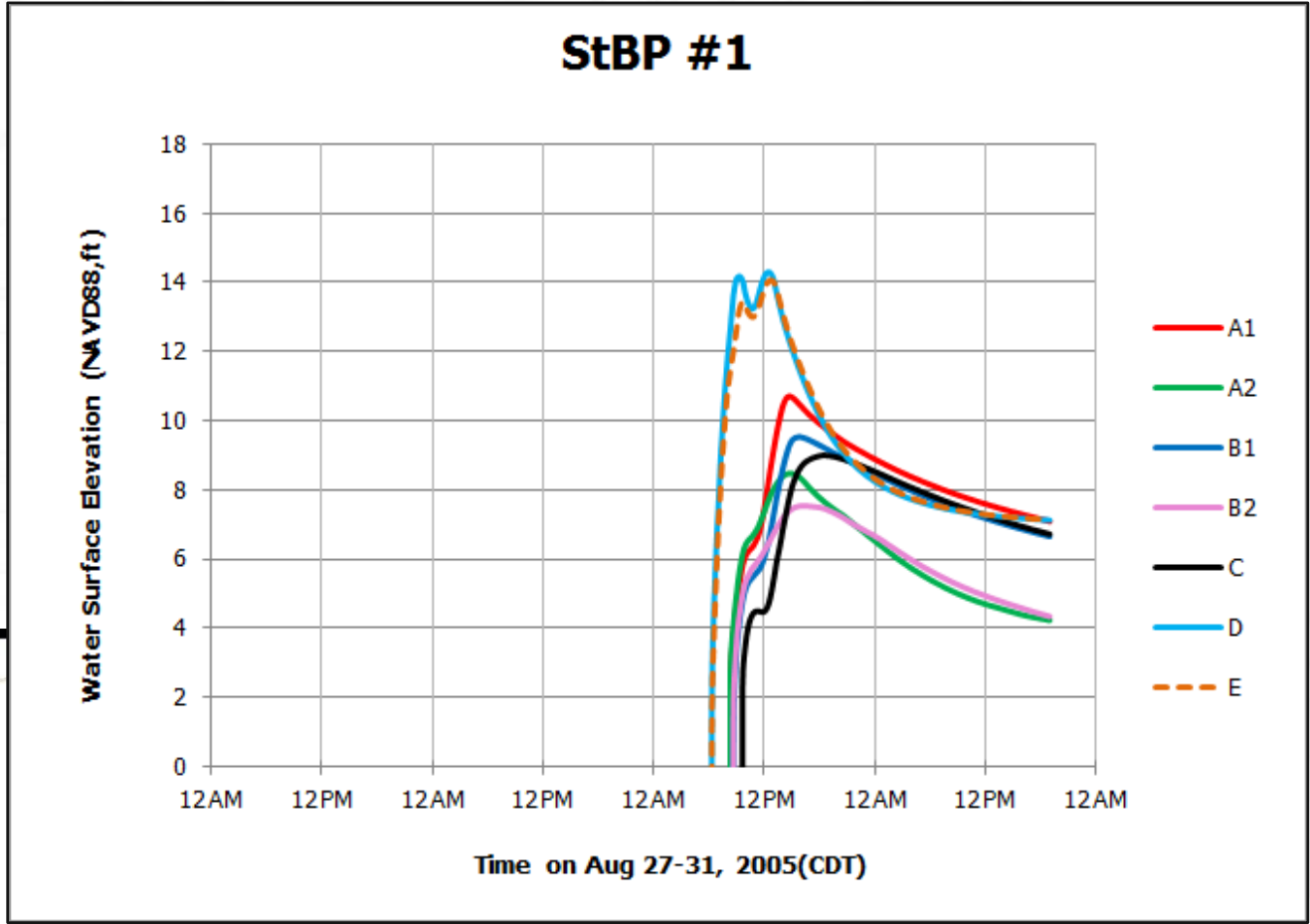
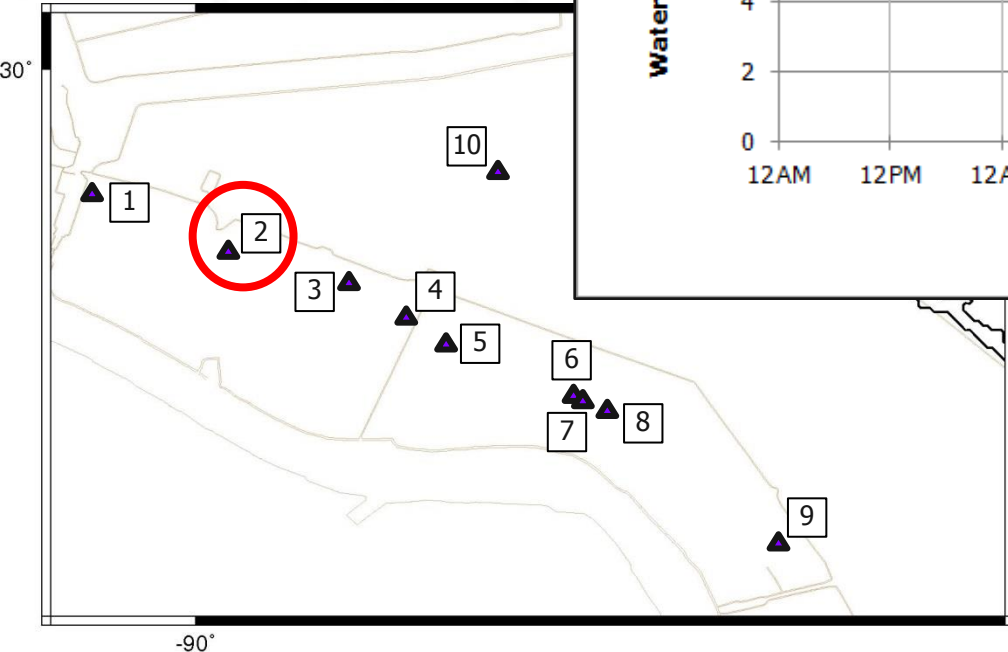


Figure 52b



# Katrina - Scenario E: Interior water surface time series at Plaintiff Properties

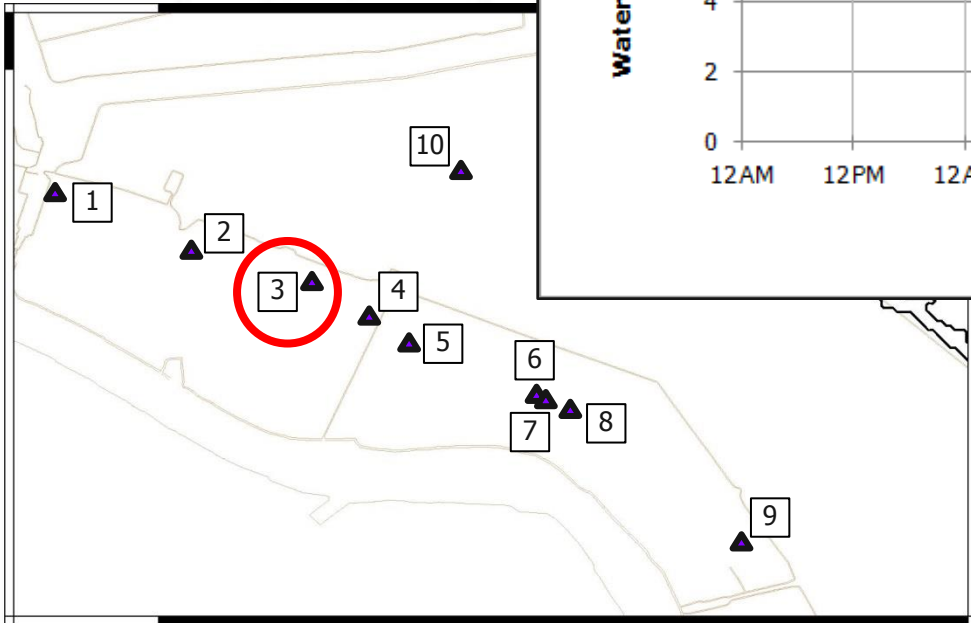
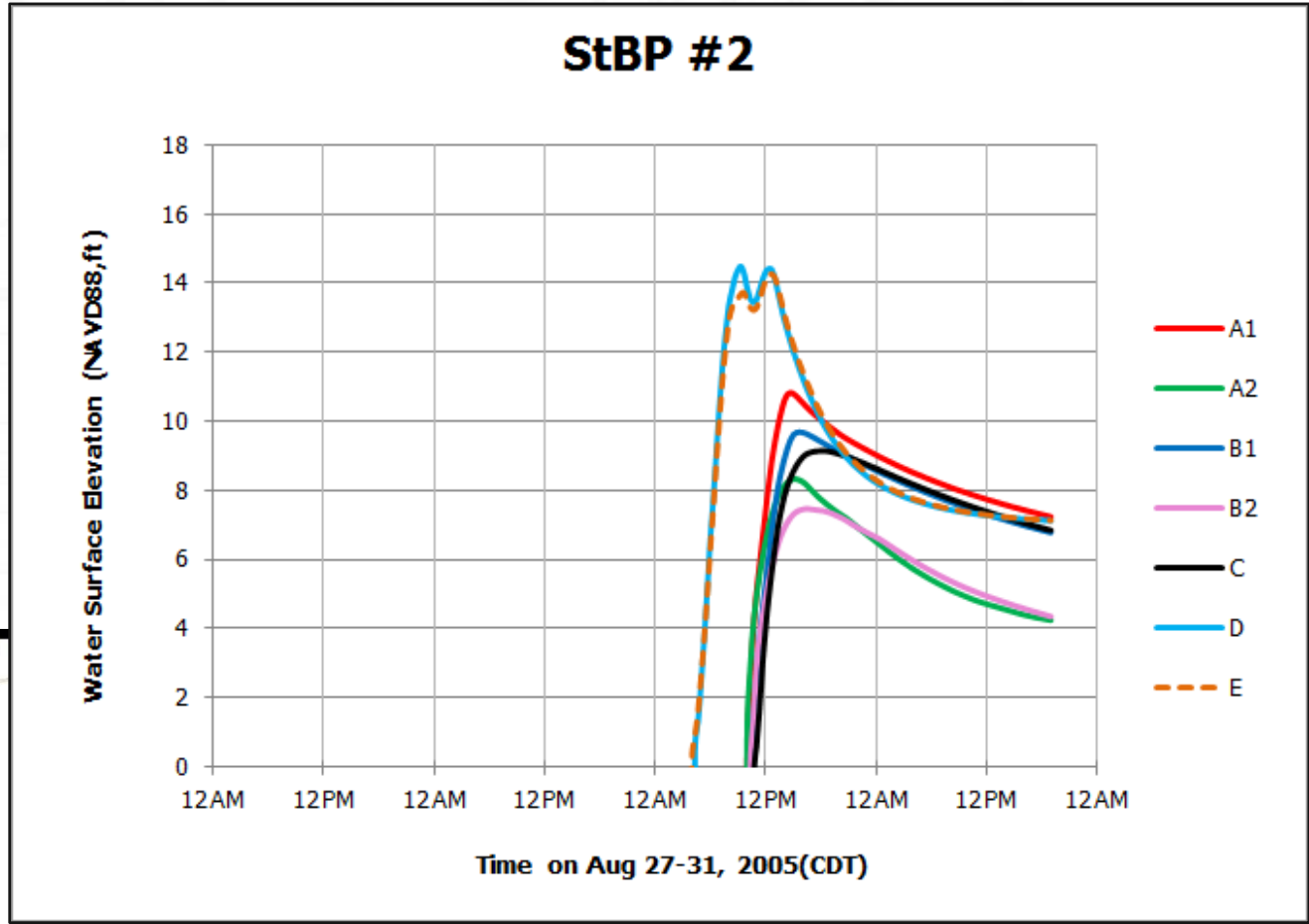


Figure 52c

# Katrina - Scenario E: Interior water surface time series at Plaintiff Properties

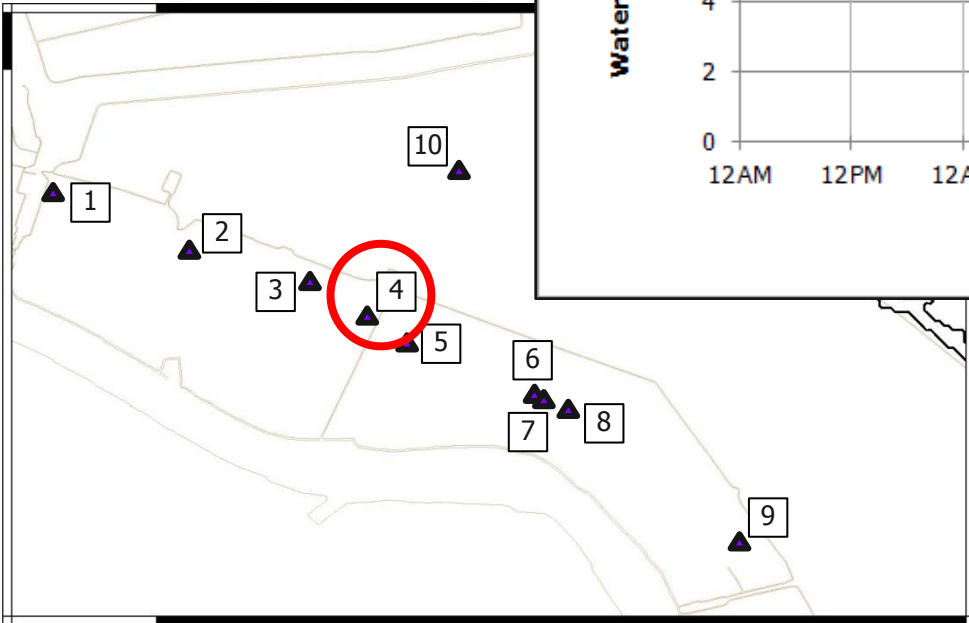
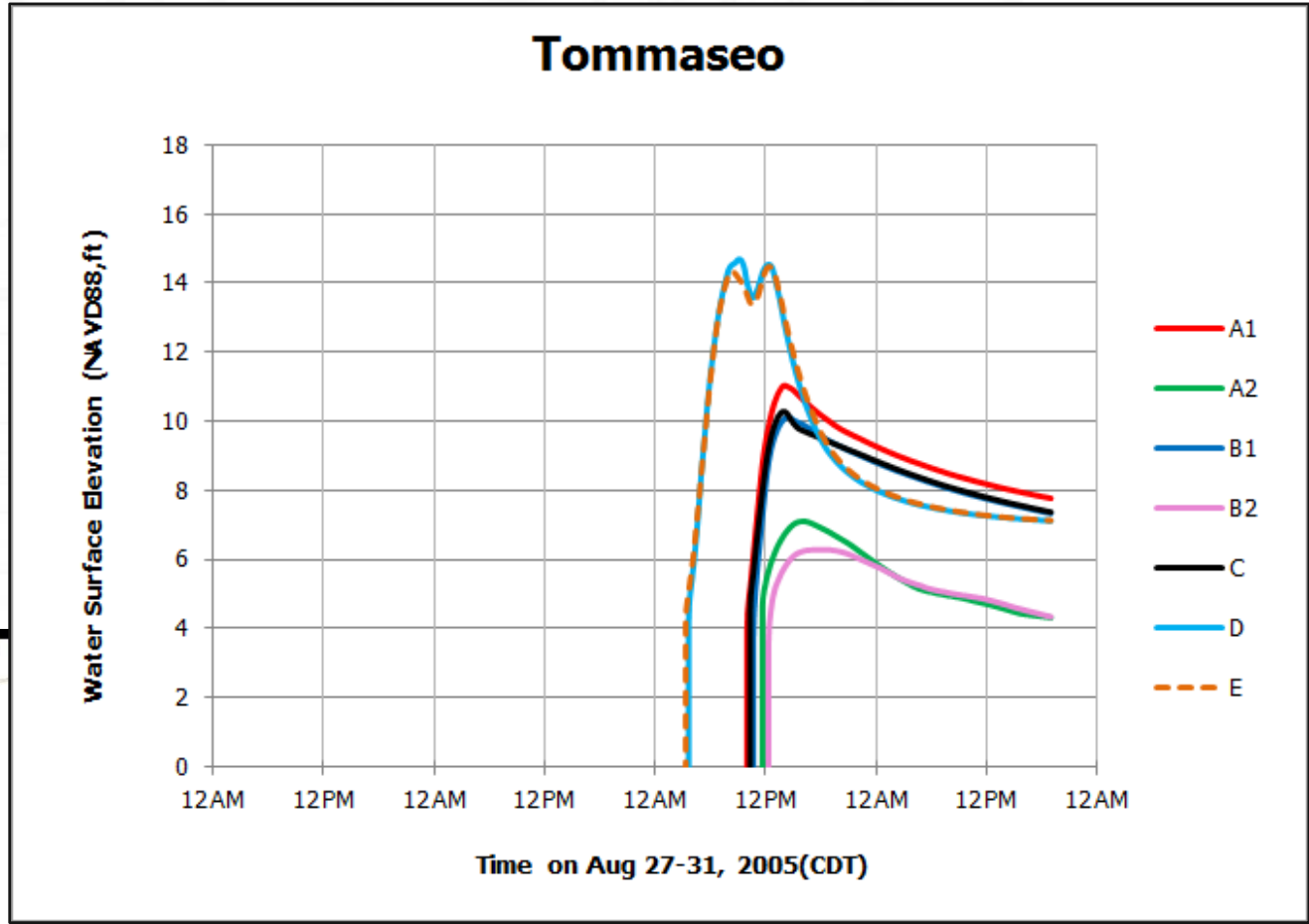


Figure 52d

# Katrina - Scenario E: Interior water surface time series at Plaintiff Properties

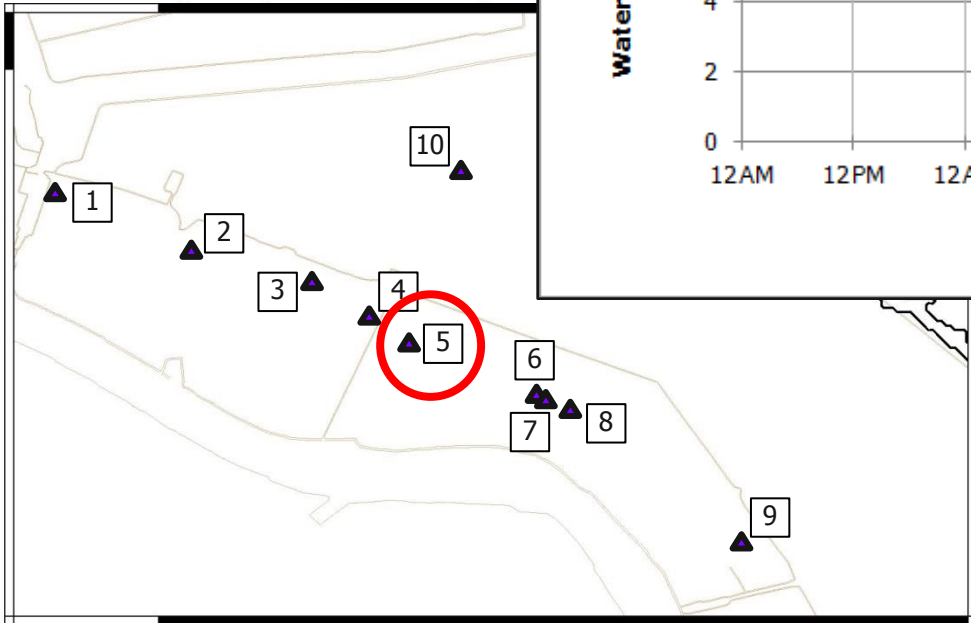
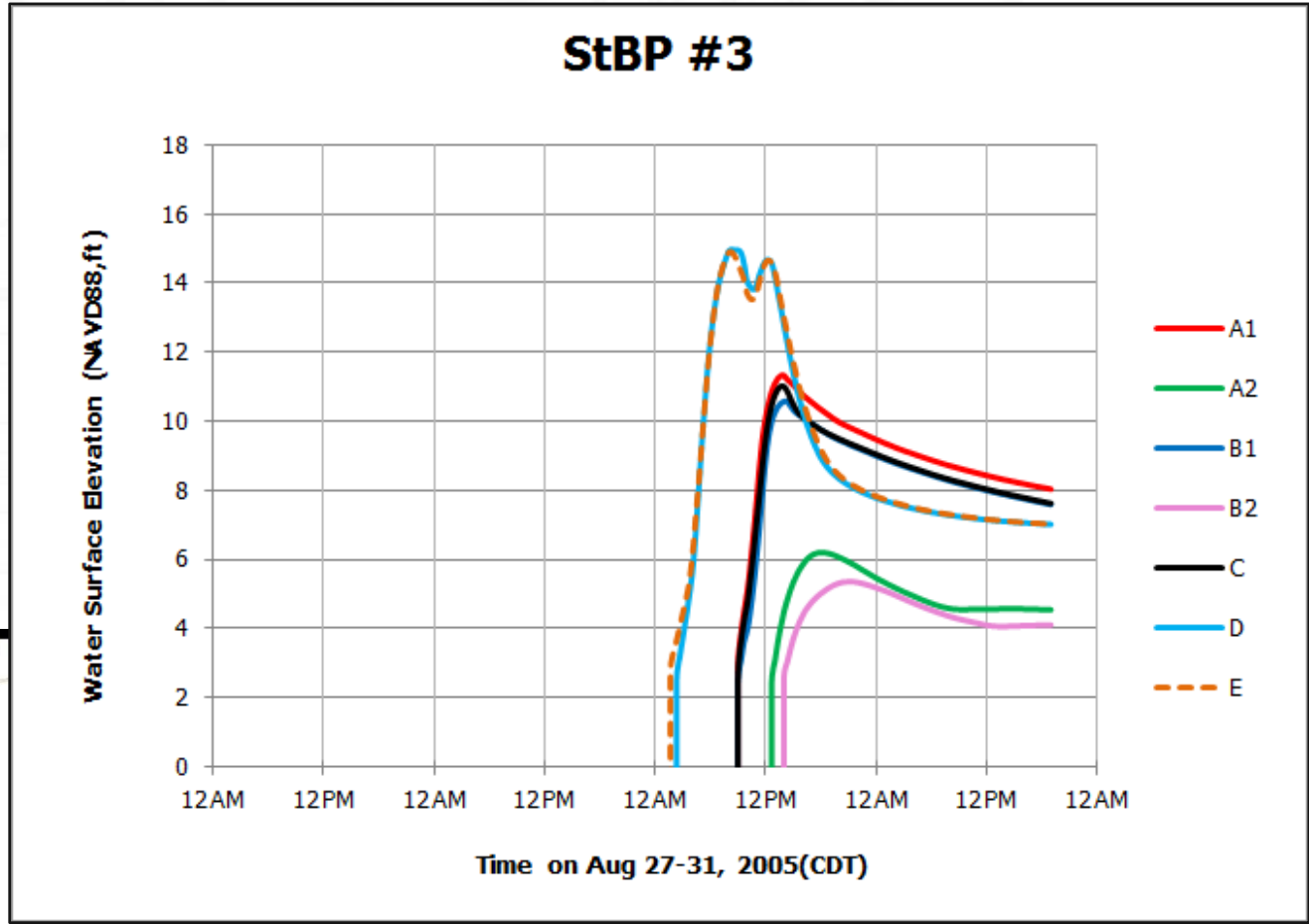


Figure 52e



# Katrina - Scenario E: Interior water surface time series at Plaintiff Properties

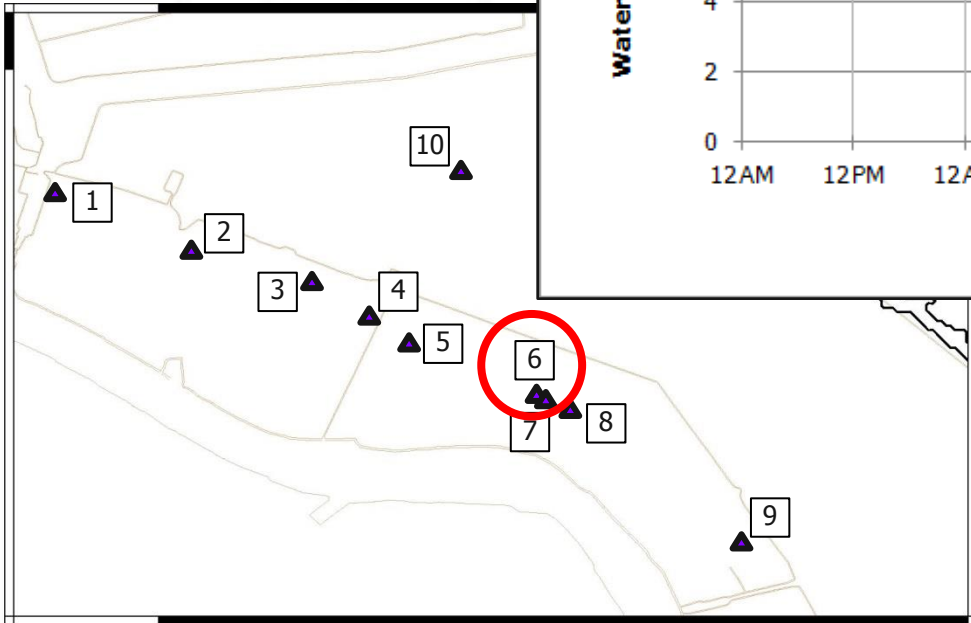
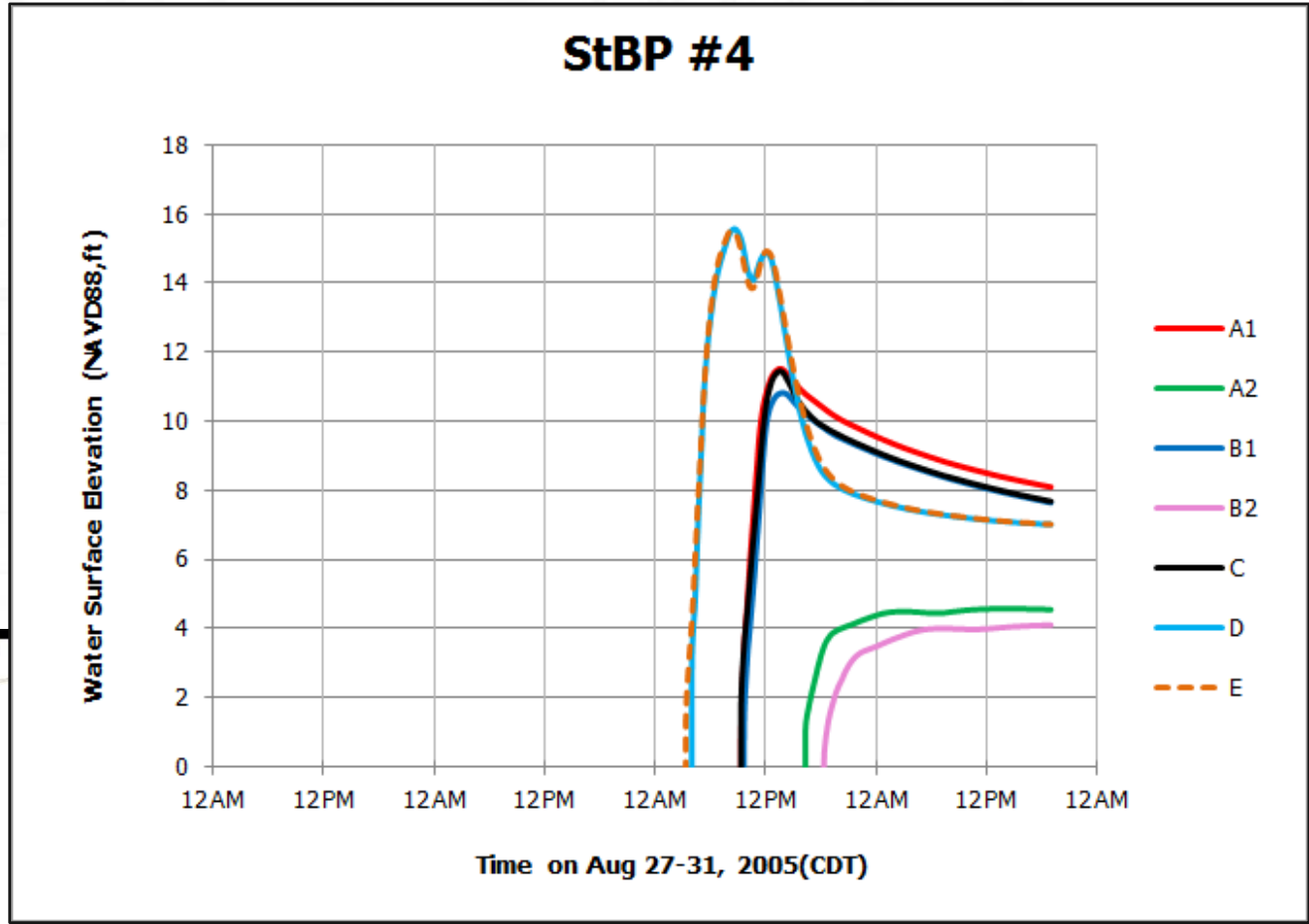


Figure 52f

# Katrina - Scenario E: Interior water surface time series at Plaintiff Properties

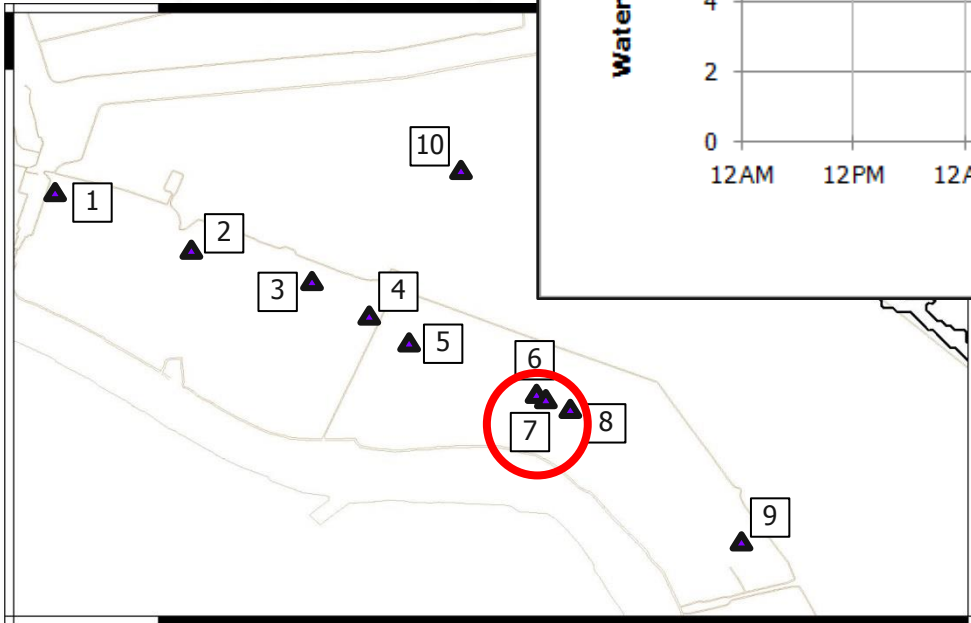
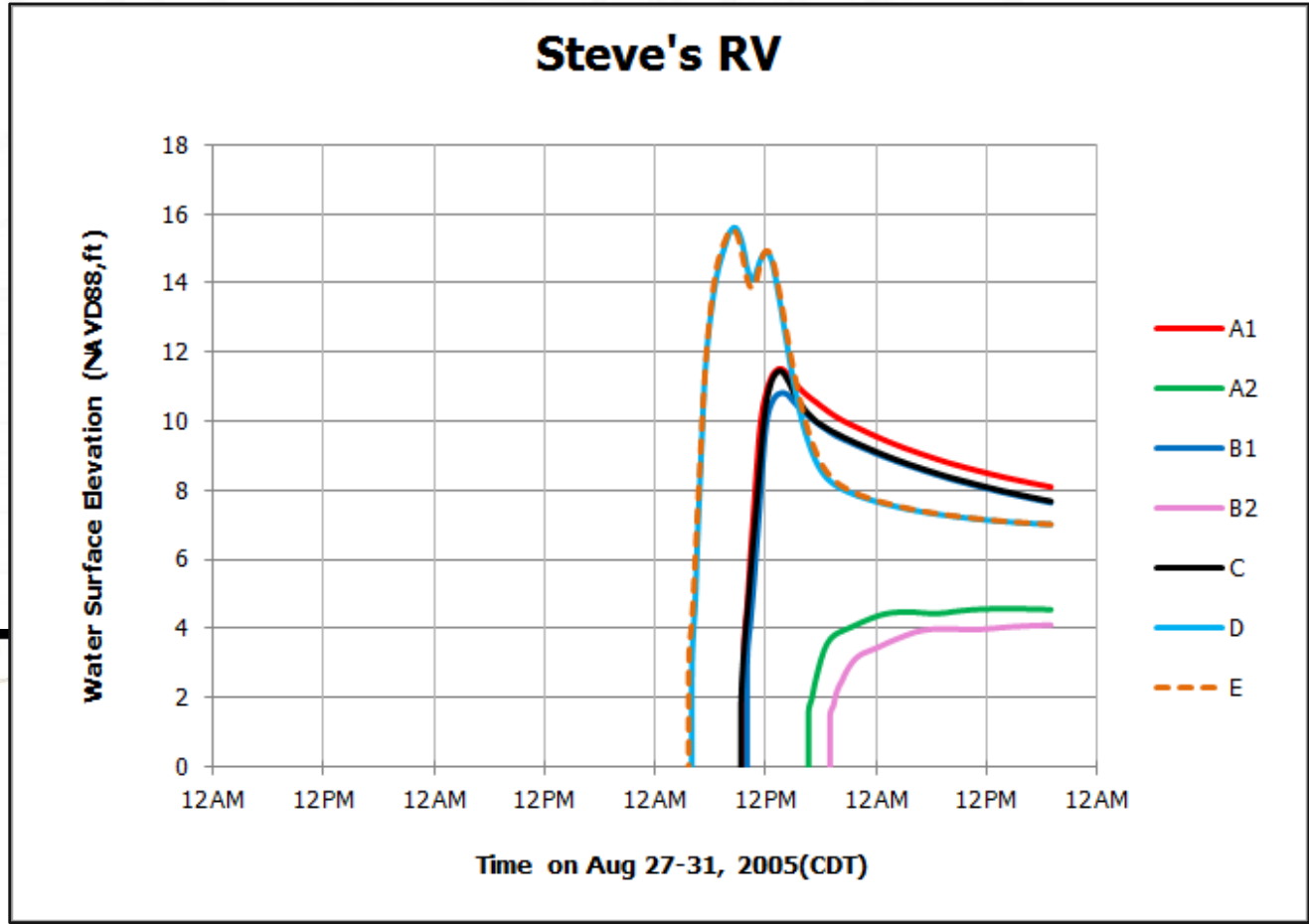


Figure 52g

# Katrina - Scenario E: Interior water surface time series at Plaintiff Properties

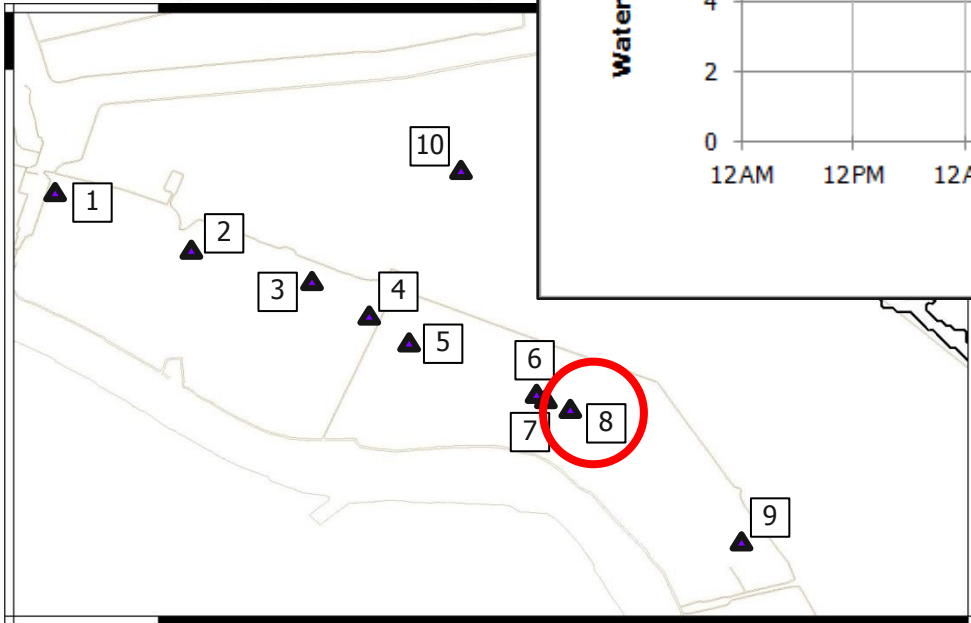
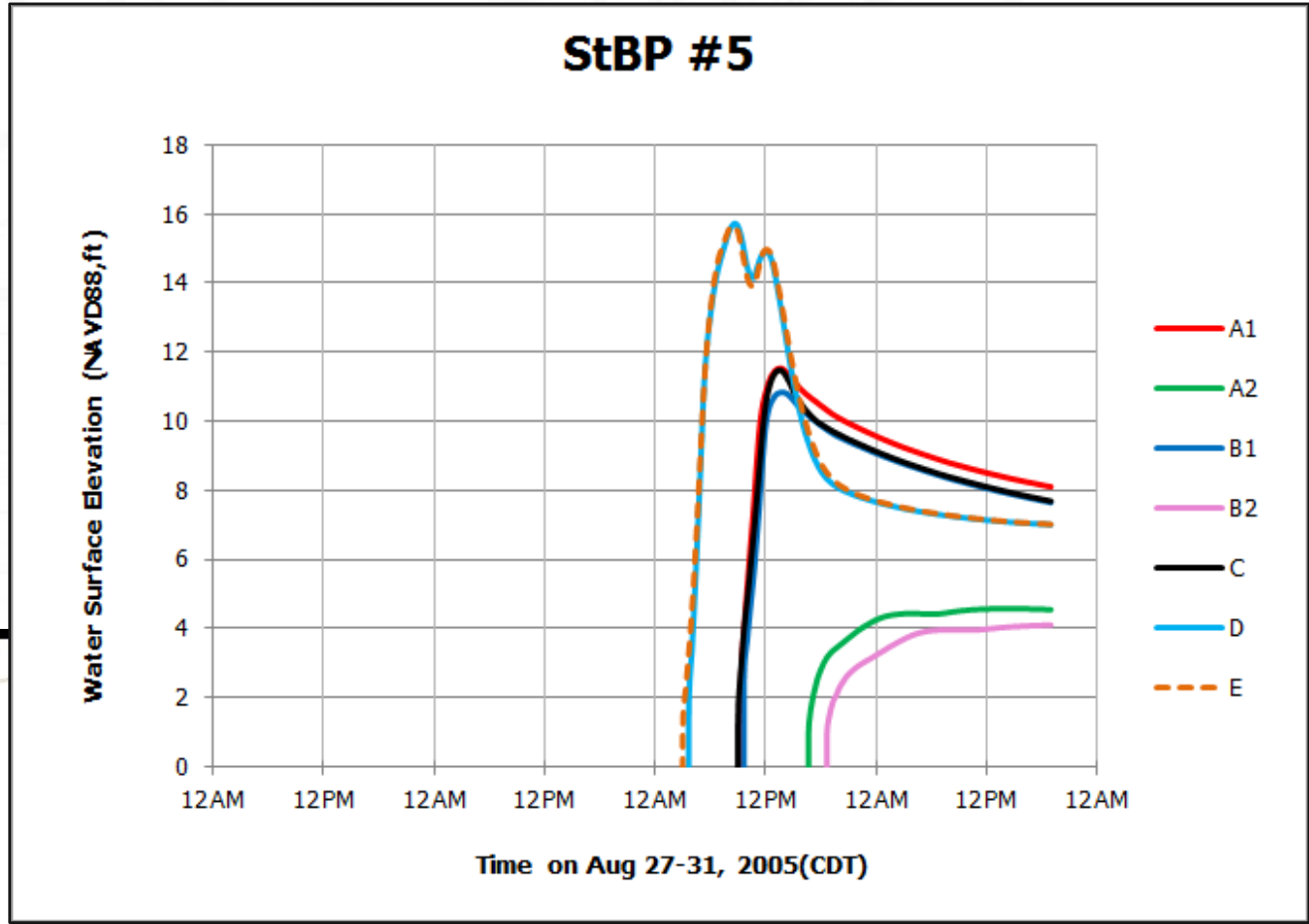


Figure 52h

# Katrina - Scenario E: Interior water surface time series at Plaintiff Properties

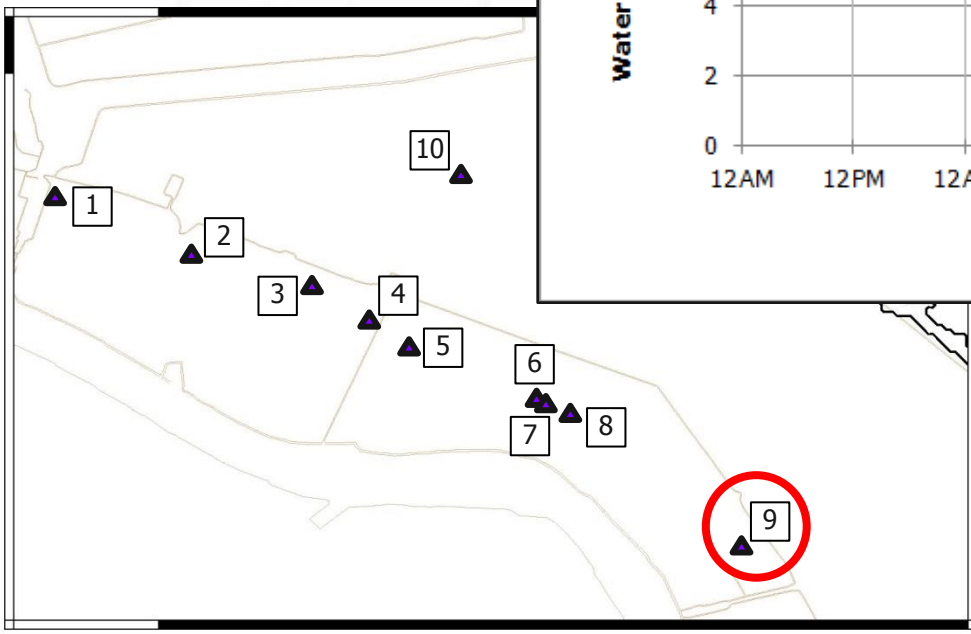
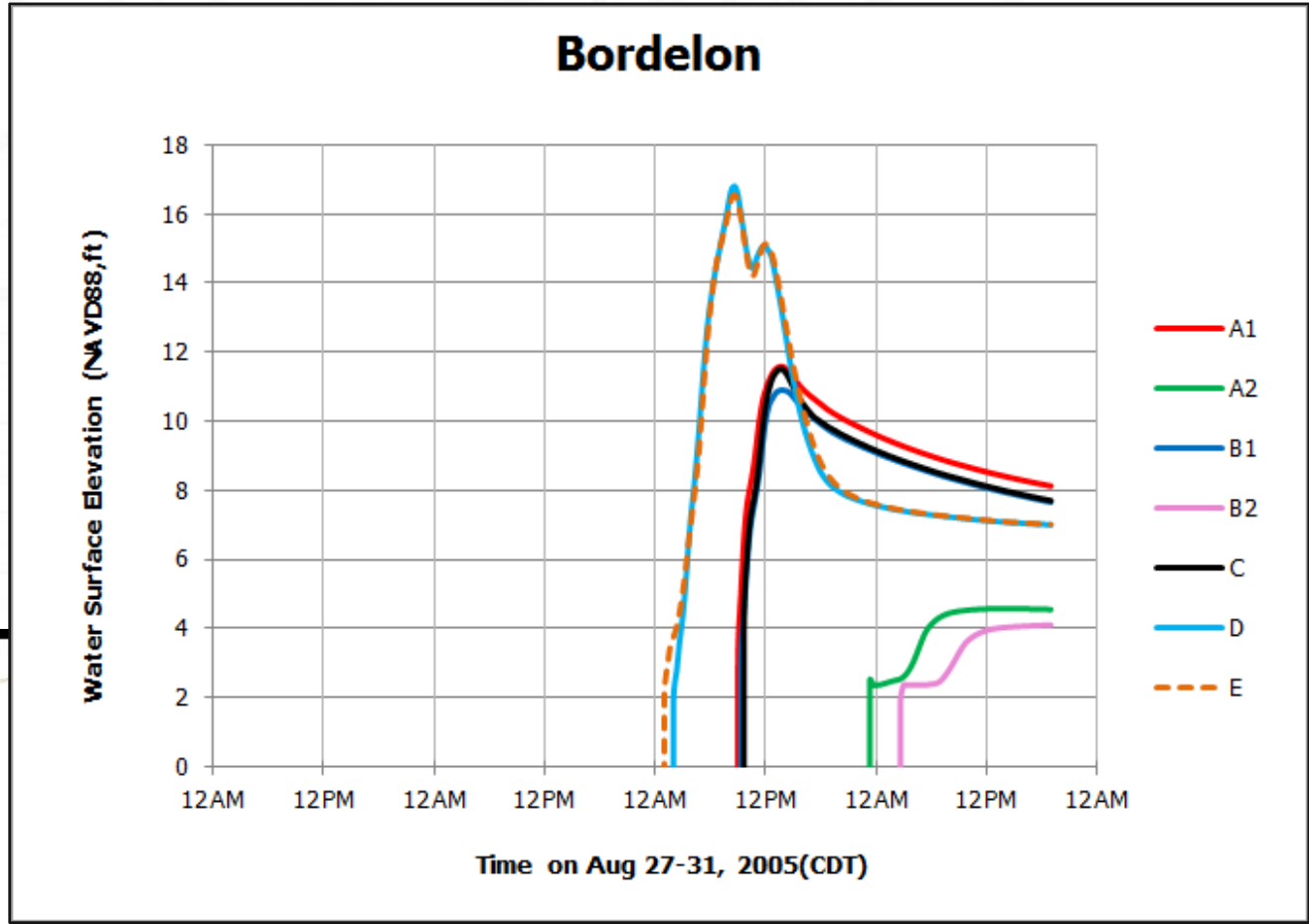


Figure 52i

# Katrina - Scenario E: Interior water surface time series at Plaintiff Properties

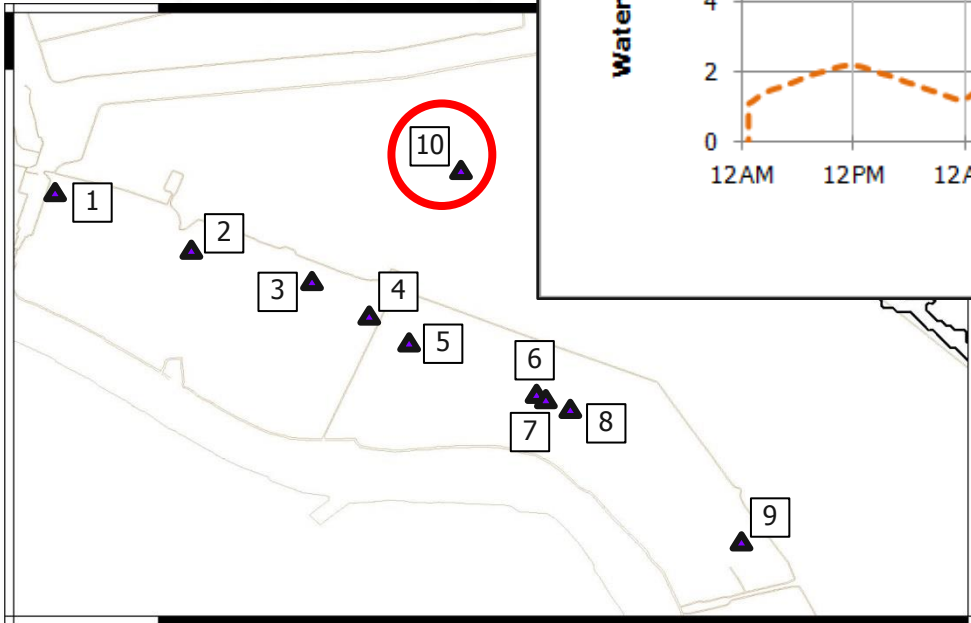
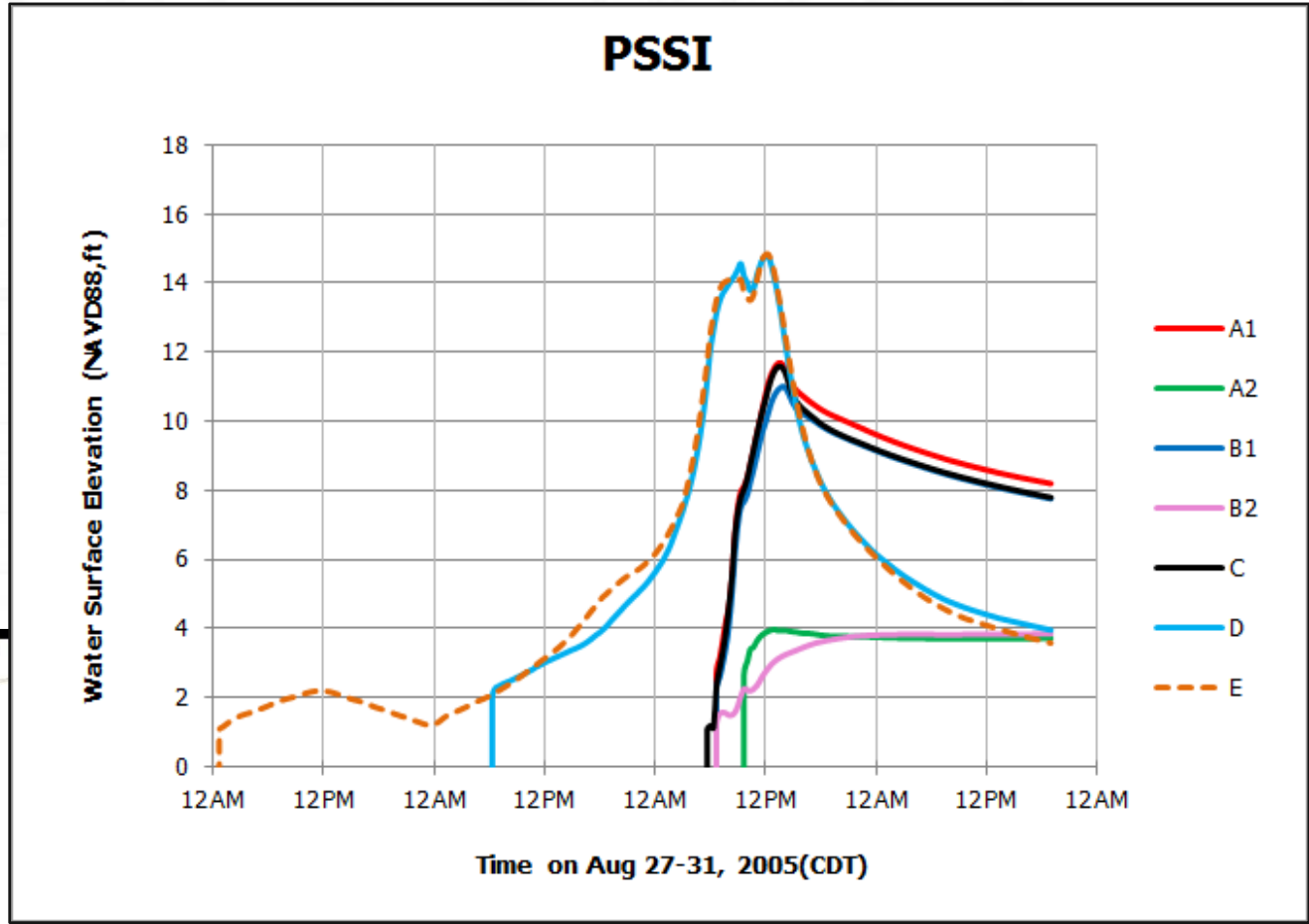


Figure 52j

# Katrina - Scenario E: Interior water surface time series at Plaintiff Properties

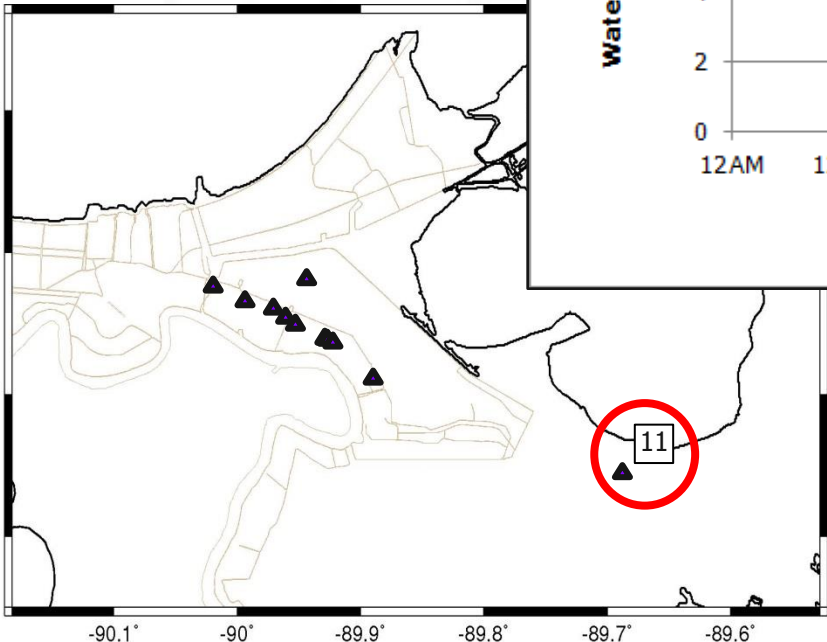
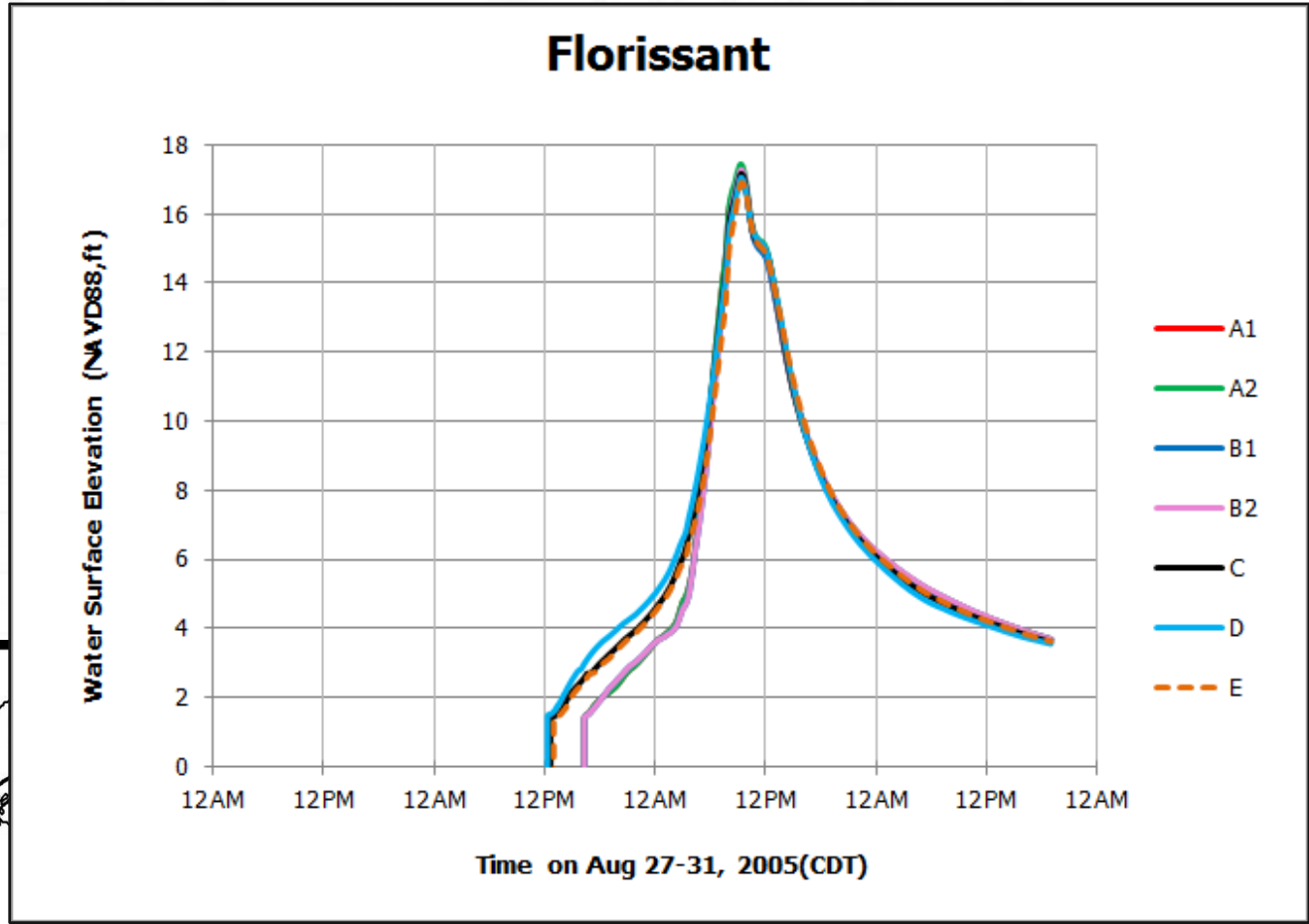


Figure 52k

## Katrina - Scenario E: Flooding conclusions for Plaintiff Properties

- The maximum water surface elevations (in ft) at each Trial Property in the Scenario E “No Federal Levees/No MRGO/1956 Wetlands” are summarized in the table below.

Location	Scenario A1	Scenario A2	Scenario B1	Scenario B2	Scenario C	Scenario D	Scenario E
Adams	10.5	9.0	9.3	8.0	8.8	14.1	13.8
SBP #1	10.7	8.5	9.5	7.5	9.0	14.3	14.1
SBP #2	10.8	8.3	9.7	7.5	9.1	14.5	14.3
Tommaseo	11.0	7.1	10.1	6.3	10.3	14.7	14.5
SBP #3	11.3	6.2	10.6	5.4	11.0	15.0	14.9
SBP #4	11.5	4.6	10.8	4.1	11.5	15.6	15.5
Steve’s RV	11.5	4.6	10.8	4.1	11.5	15.6	15.6
SBP #5	11.5	4.6	10.8	4.1	11.5	15.8	15.7
Bordelon	11.6	4.6	10.9	4.1	11.5	16.8	16.6
PSSI	11.7	4.0	11.0	3.8	11.6	14.8	14.9
Florissant	17.3	17.5	17.2	17.3	17.2	17.1	16.9

Table 16