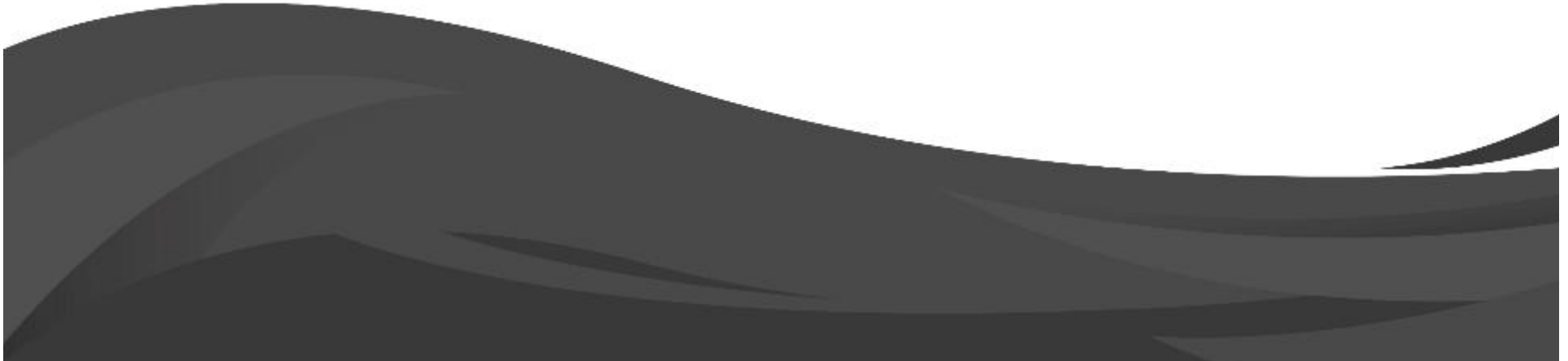





# **HOUSTON WATER RESPONSE WEATHER EXTREMES**

**YVONNE W FORREST  
DEPUTY DIRECTOR HOUSTON WATER  
HOUSTON PUBLIC WORKS  
MARCH 19, 2018**





## TABLE OF CONTENTS

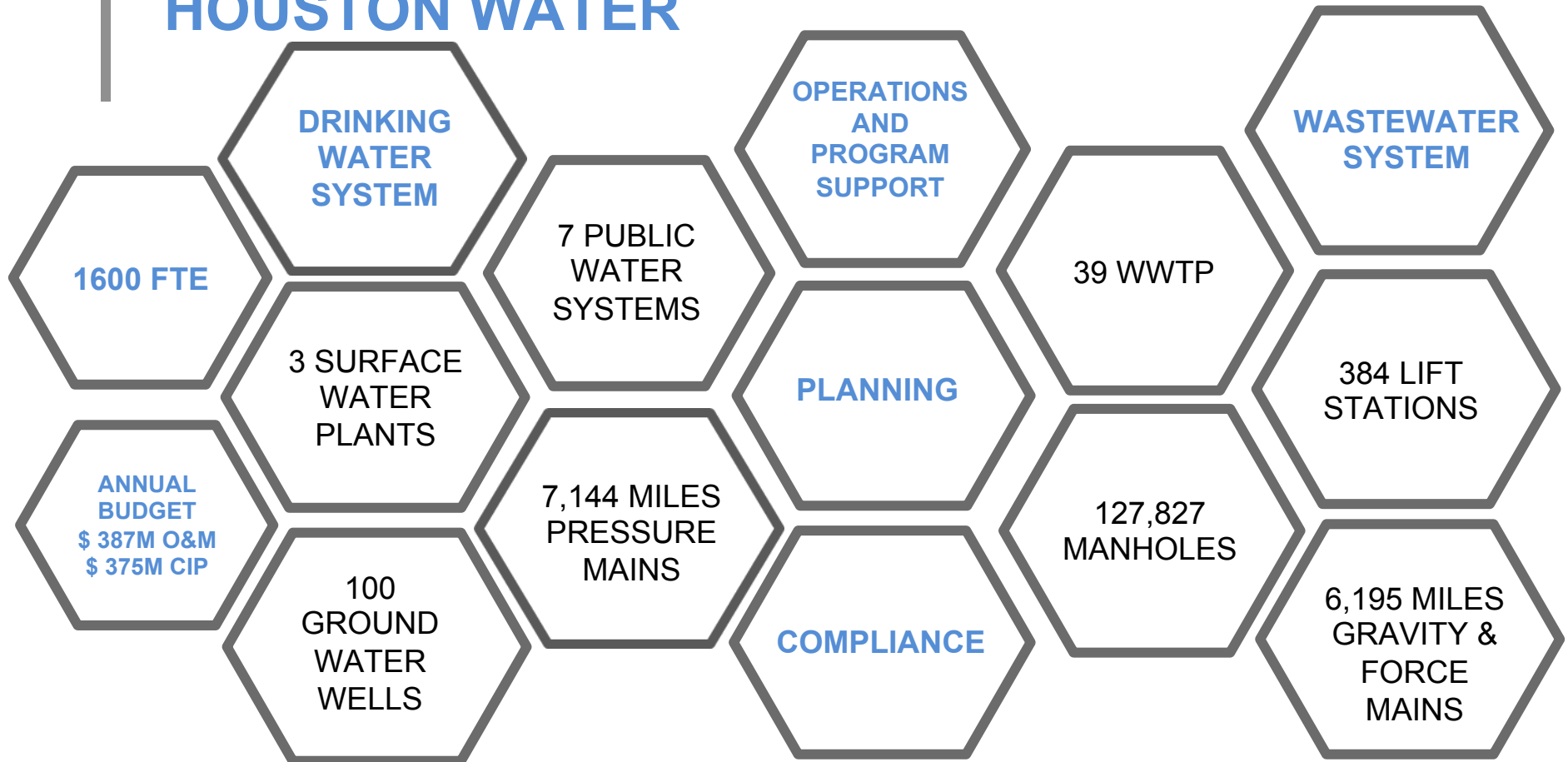
- HOUSTON WATER SYSTEM
  - WEATHER EXTREMES EXPERIENCED
  - HURRICANE HARVEY
  - LESSONS LEARNED
- 

The land area of all these cities COMBINED would fit within our land area.

Houston Area:  
650 Sq. Miles



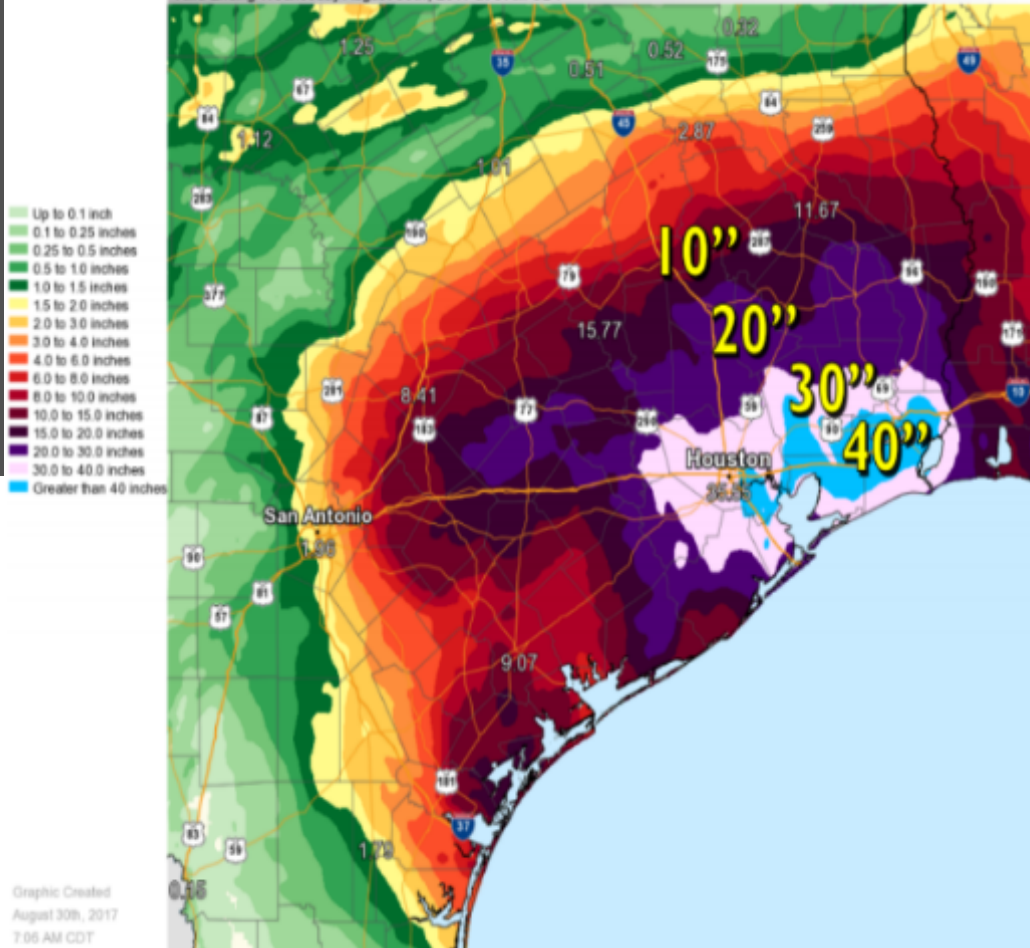
# HOUSTON WATER



## WEATHER EVENTS

- 2008 HURRICANE IKE – CAT 2, 110 MPH MAX SUSTAINED WINDS
- 2011 DROUGHT OF RECORD ~45 WEEKS, 95% OF TX IN DROUGHT
- 2015 MEMORIAL DAY FLOOD, 12” RAIN IN 10 HOURS
- 2016 TAX DAY FLOOD, 17” RAIN IN 14 HOURS
- 2016 MEMORIAL DAY FLOOD, BEGAN BUILDING AN ARK
- 2017 HURRICANE HARVEY, 36-48” RAIN IN HOUSTON METRO

Valid Ending Wednesday August 30th, 2017 at 6 AM CDT



## 5 Day Point Rainfall Amounts in Inches

- Harvey continued to produce record breaking **rainfall totals of 45 to over 50 inches...** with continued rainfall
- **Cedar Bayou - 51.88**
- **Berry Bayou - 44.88**
- **League City - 49.84**
- **Mary's Creek - 49.80**
- **Goose Creek - 44.08**
- **Greens Bayou - 41.36**
- **Buffalo Bayou - 35.60**
- **Addicks Dam - 33.44**



Point rainfall  
data courtesy



# Hurricane Harvey 2017

>60" Rain

Houston, TX

31 of 67 river forecast points set new records!



80% of Harvey flood victims didn't have flood insurance!  
(Consumer Federation of America estimate)

82 fatalities, ~155,000 structures flooded, ~1/4 million vehicles flooded



Figure 17. Texas World Speedway after Harvey being used to store flooded cars. Photo credit Brazos Drones.



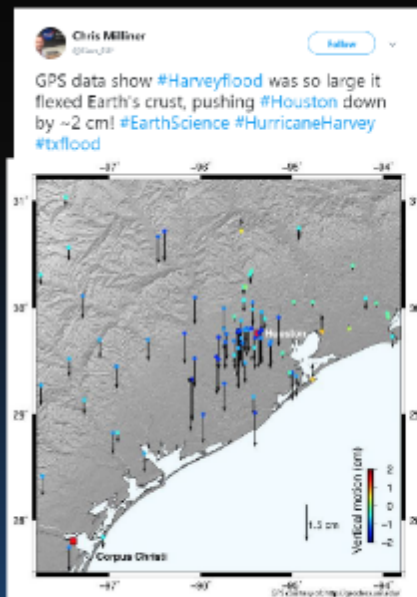
Lake Houston Spillway 8/30/17

Beltway 8 @ I-10 Toll Road 9/2/17



# 2 cm is estimate how much Houston sank into the Earth under weight of water from Harvey

Source- Chris Milliner, NASA JPL



# DRINKING WATER OPERATIONS



**NO**  
Power  
Loss

Drinking  
water  
remained  
**SAFE!**

**NO**  
boil water  
notice issued

## SINCE HARVEY

- LEAK ON 102" RAW WATER LINE
- LEAK ON 66" TREATED WATER LINE
- LEAK ON 54" TREATED WATER LINE
- LEAK ON 48' TREATED WATER LINE
- HUNDREDS OF LEAKS IN DISTRIBUTION SYSTEM
- RAW WATER QUALITY HAS CHANGED

# WASTEWATER OPERATIONS



Turkey Creek Wastewater Treatment Plant

**4**  
wastewater  
plants  
flooded

**100** lift  
stations  
damaged

**All** plants  
operational  
within 3  
weeks

# IMPACT



West District Treatment Plant



# WASTEWATER TREATMENT PLANTS DURING HARVEY



# WASTEWATER TREATMENT PLANT AFTER HARVEY



## LESSONS LEARNED/FOCUS FORWARD

- STAFFING

- ASSET MANAGEMENT

- PARTNERS

- PATIENCE AND FLEXIBILITY

# BACK IN BUSINESS

[YVONNE.FORREST@HOUSTONTX.GOV](mailto:YVONNE.FORREST@HOUSTONTX.GOV)