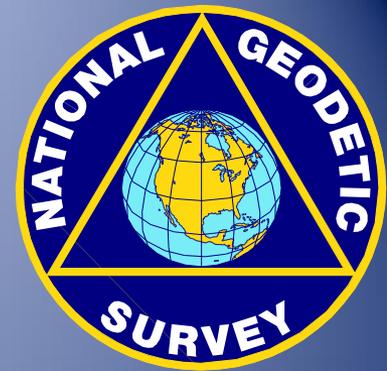




# HSRP Public Meeting

Courtyard Marriott  
125 Calhoun Street  
Charleston, SC 29401



## *Mean Sea Level Tidal Datums & Mapping for Coastal Flooding and to Address FEMA Flood Insurance Rates Along the US Coast*

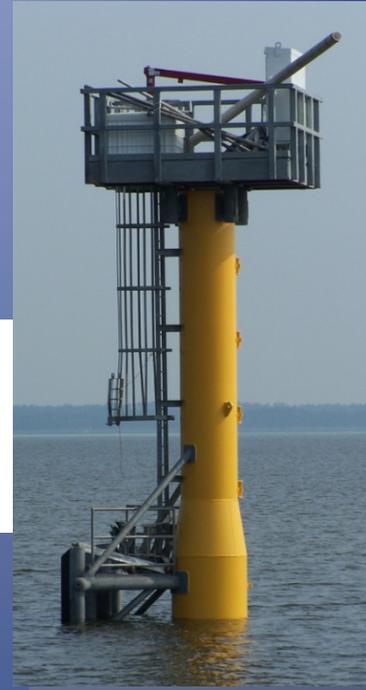


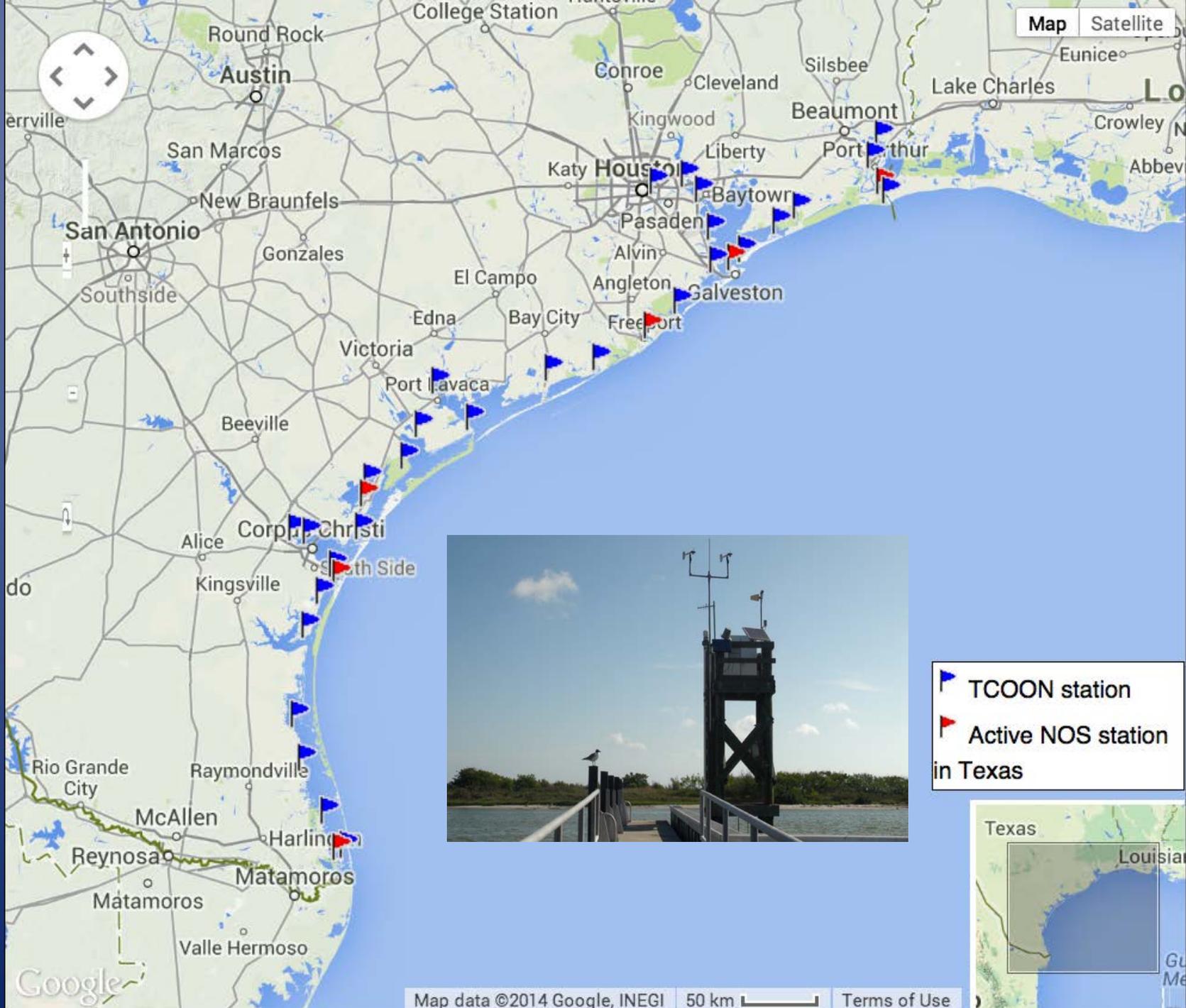
Dr. Gary Jeffress, RPLS  
Texas Spatial Reference Center



# Texas Coastal Ocean Observation Network (TCOON)

<http://cbi.tamucc.edu/TCOON/>





Map Satellite



- ▲ TCOON station
- ▲ Active NOS station in Texas



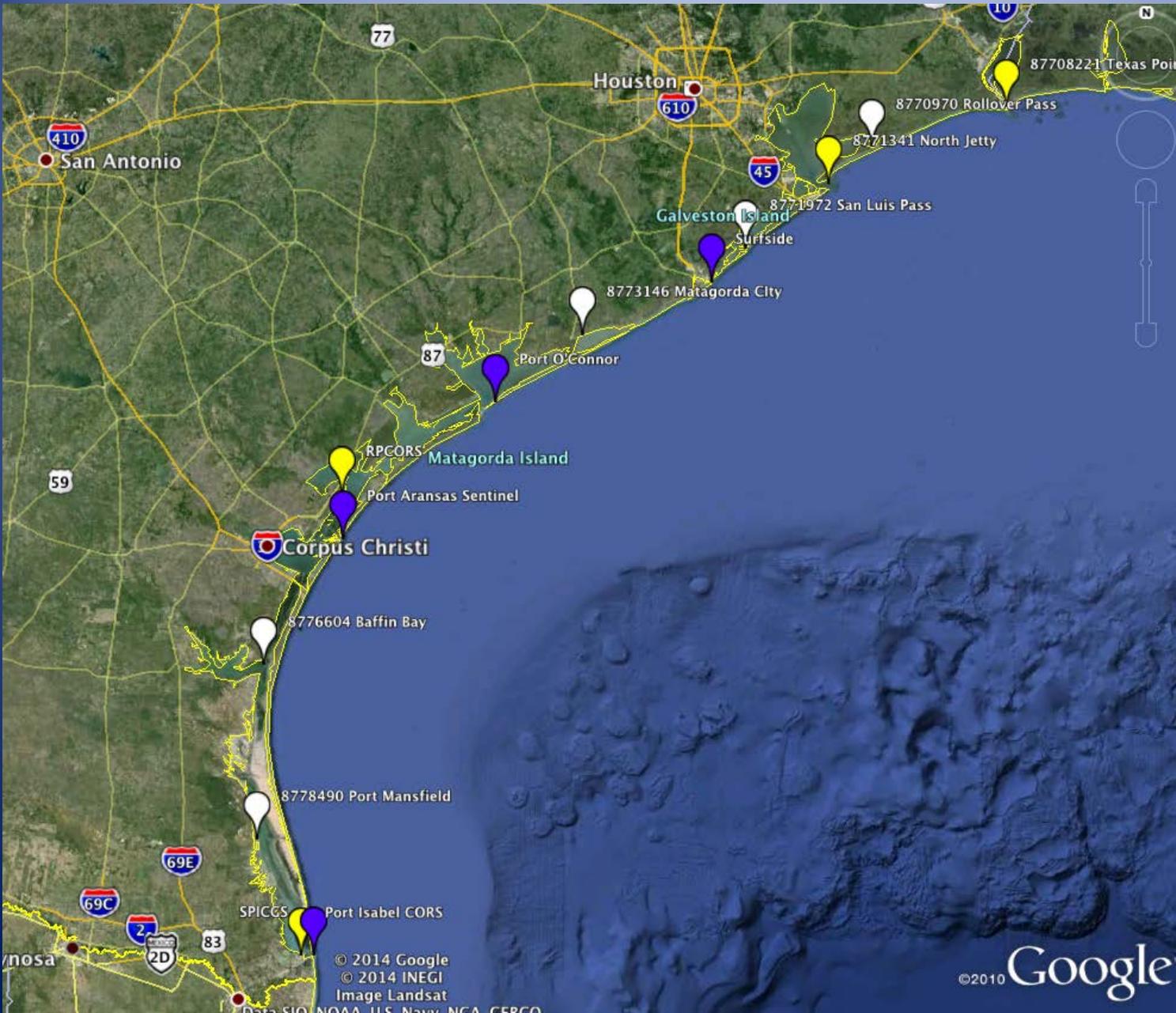
# Height Modernization Recent Projects

- 2012-2013 GPS Precise Network Observations Along the Texas Gulf Coast
  - TCOON Tide gauge Benchmarks
  - Historic USACE tidal benchmarks
  - Texas CORS
  - GPS-able NGS first & second order Benchmarks
- A total of 72 network sessions and 153 stations observed (Adjust and Pages)
- All stations Bluebooked
- Funded by US Army Corps of Engineering

# 2012-2013 GPS Precise Network Observations Along the Texas Gulf Coast



# CORS on Tide Gauges Texas



Existing CORS 4  
(USACE 2,  
NERRS 1,  
USFW 1)  
Proposed  
Sentinel CORS 4  
(USFW)  
Proposed  
Height Mod.  
CORS 5  
TOTAL 13



# The need for accurate Elevation along the US Coastline

Short Term Sea Level Rise:

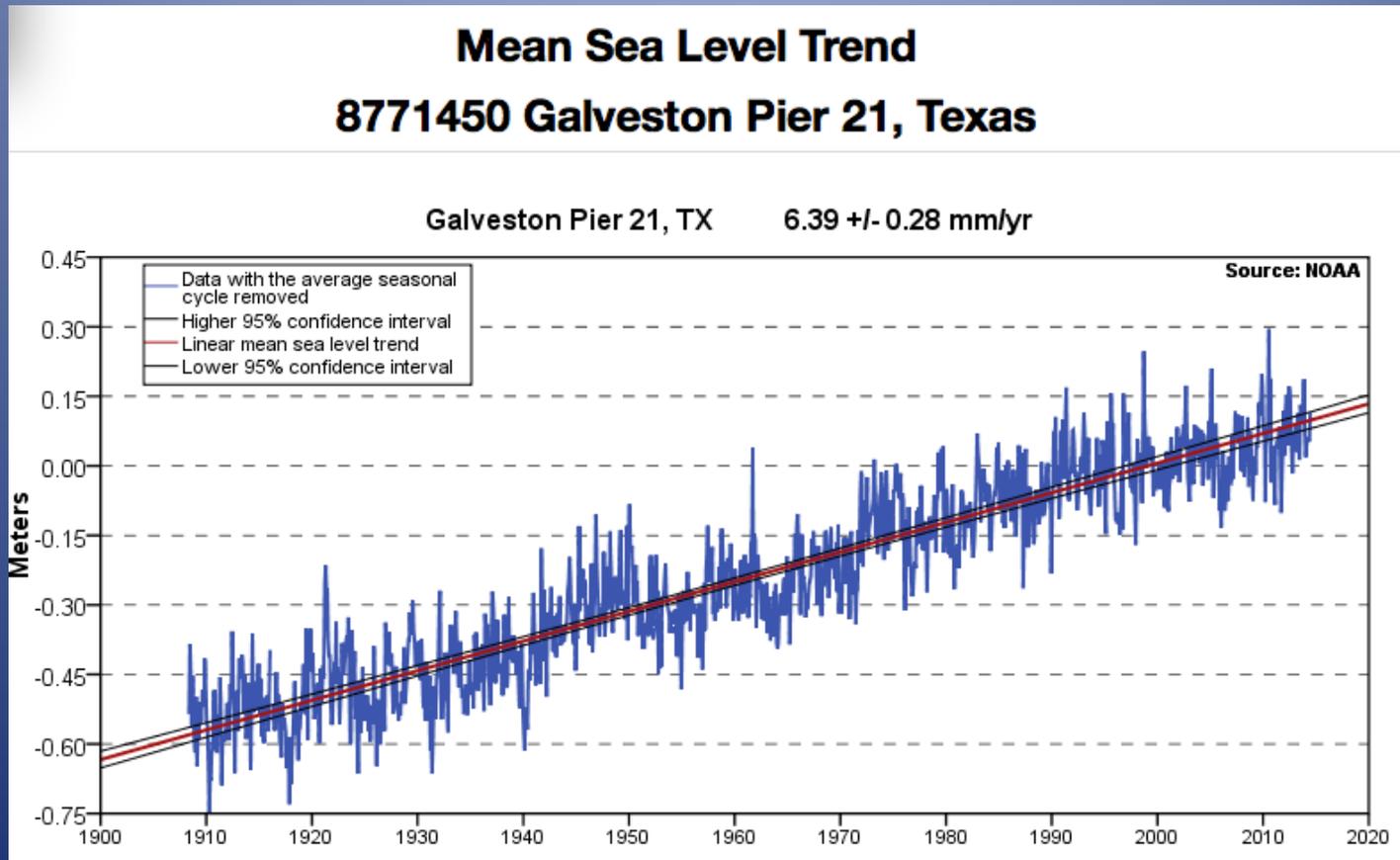


Tropical Storm Sandy – Tuckerton, NJ 29 Oct. 2013

From: [http://www.boston.com/bigpicture/2012/10/hurricane\\_sandy\\_the\\_superstorm.html](http://www.boston.com/bigpicture/2012/10/hurricane_sandy_the_superstorm.html)

# The need for accurate Elevation along the US Coastline

## Long Term Sea Level Rise:



1909

2013

From

[http://www.co-ops.nos.noaa.gov/sltrends/sltrends\\_station.shtml?name=Galveston+Pier+21&state=Texas&stnid=8771450&start\\_yr=1908&end\\_yr=1998&slt=6.5&sterr=0.16](http://www.co-ops.nos.noaa.gov/sltrends/sltrends_station.shtml?name=Galveston+Pier+21&state=Texas&stnid=8771450&start_yr=1908&end_yr=1998&slt=6.5&sterr=0.16)[http://www.co-ops.nos.noaa.gov/sltrends/sltrends\\_station.shtml?name=Galveston+Pier+21&state=Texas&stnid=8771450&start\\_yr=1908&end\\_yr=2013&slt=6.5&sterr=0.16](http://www.co-ops.nos.noaa.gov/sltrends/sltrends_station.shtml?name=Galveston+Pier+21&state=Texas&stnid=8771450&start_yr=1908&end_yr=2013&slt=6.5&sterr=0.16)

# Covering the risks of flooding along the US Coastline



FEMA



## Coastal Flood Hazard Mapping Studies

### Benefits of Coastal Flood Hazard Mapping Studies

- Updated flood hazard data and maps to help coastal communities understand their risk

From: [http://www.fema.gov/media-library-data/20130726-1917-25045-4241/risk\\_map\\_coastal\\_factsheet\\_508.pdf](http://www.fema.gov/media-library-data/20130726-1917-25045-4241/risk_map_coastal_factsheet_508.pdf)

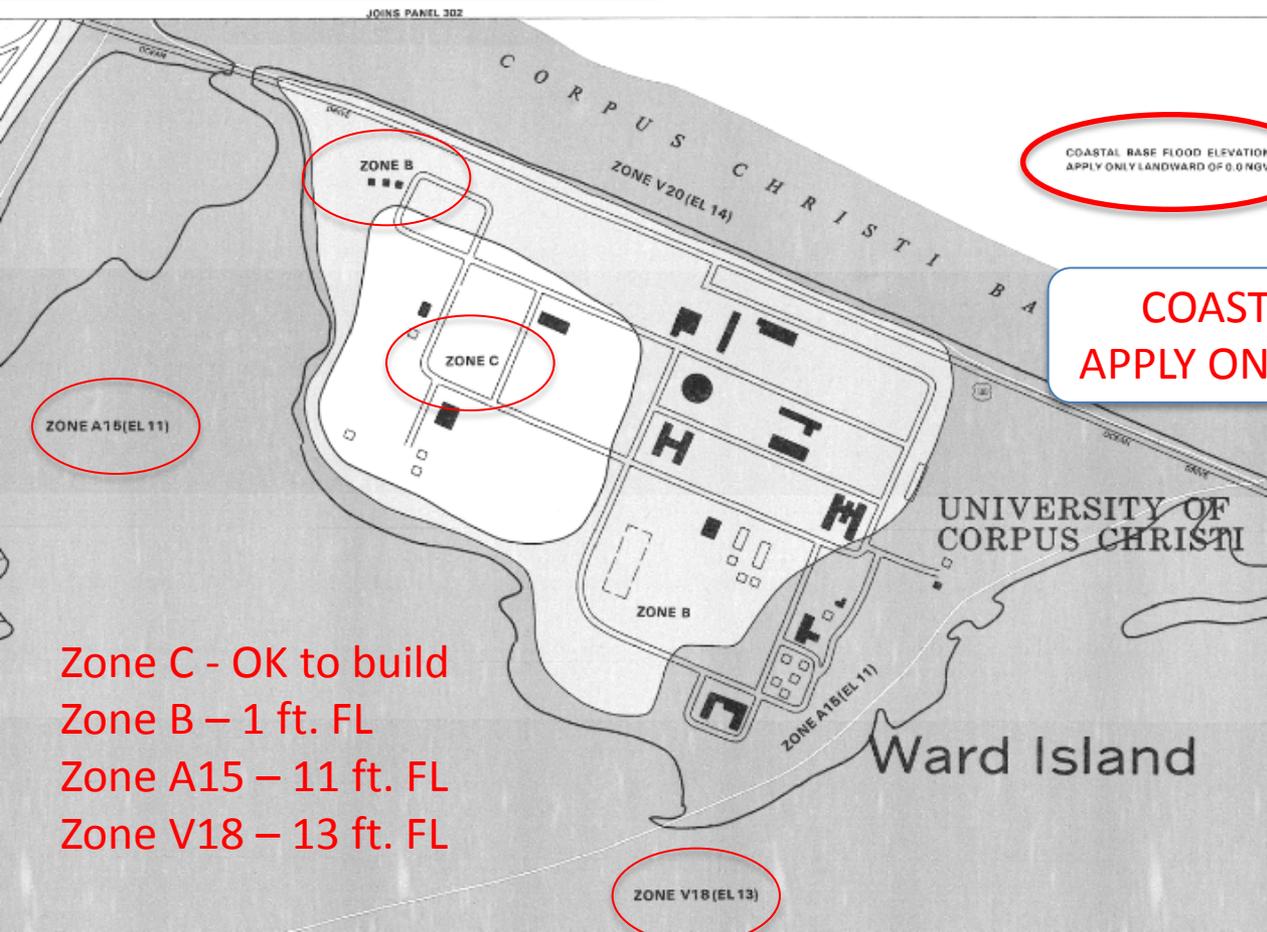
# Flood Insurance Rate Maps

Texas A&M University-Corpus Christi  
(was University of Corpus Christi until 1970)

**FIRM**  
FLOOD INSURANCE RATE MAP

CITY OF  
**CORPUS CHRISTI,**  
**TEXAS**  
NUECES AND KLEBERG  
COUNTIES

**PANEL 304 OF 405**  
(SEE MAP INDEX FOR PANELS NOT PRINTED)



**COASTAL BASE FLOOD ELEVATIONS  
APPLY ONLY TO LANDWARD OF 0.0 NAVD**

Zone C - OK to build  
Zone B - 1 ft. FL  
Zone A15 - 11 ft. FL  
Zone V18 - 13 ft. FL

**COMMUNITY-PANEL NUMBER**  
485464 0304 C

**MAP REVISED:**  
JULY 18, 1985



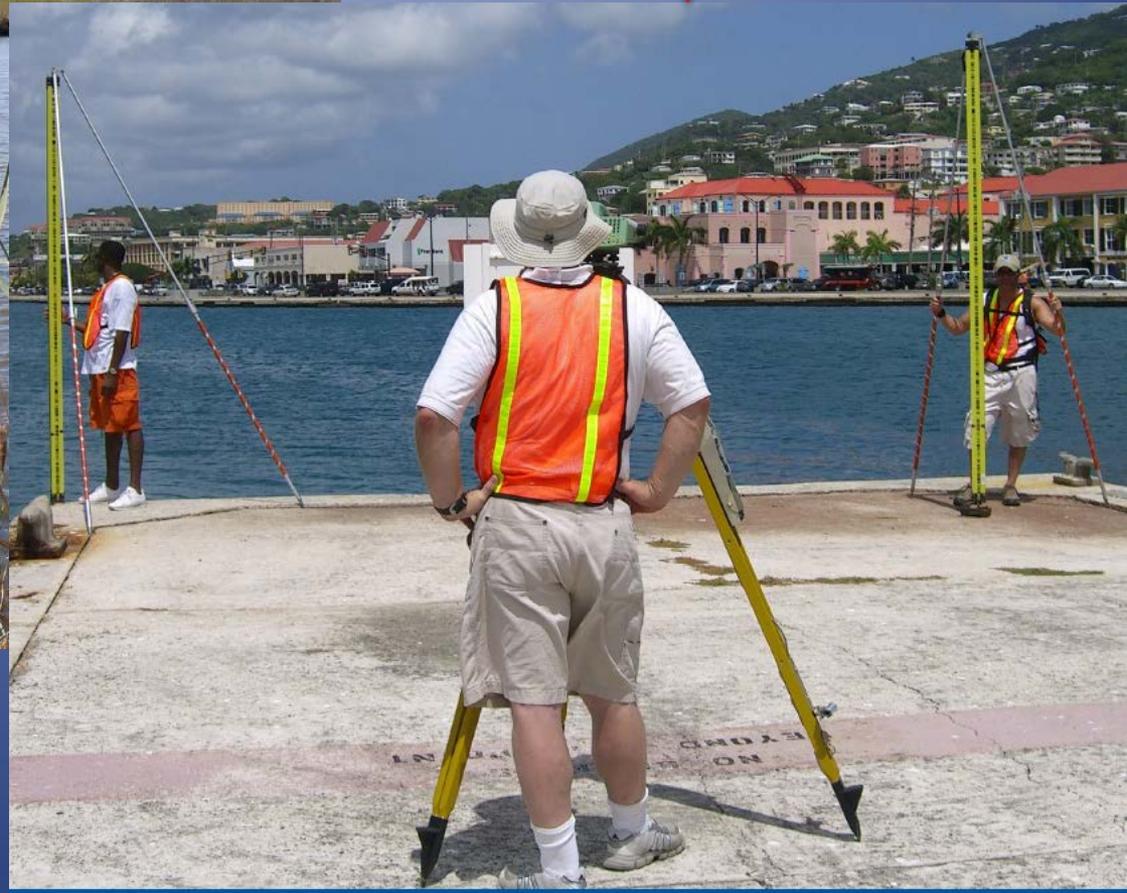
# Determining Elevation on the Ground

*NOAA is working to improve the measurement of elevations within coastal ecosystems that serve as buffers against floods.*



Surveyors performing GPS tied to NGS CORS network

Surveyors performing conventional leveling tied to NGS benchmarks



# Licensed Surveyor's Role

U.S. DEPARTMENT OF HOMELAND SECURITY  
FEDERAL EMERGENCY MANAGEMENT AGENCY  
National Flood Insurance Program

## ELEVATION CERTIFICATE

**IMPORTANT:** Follow the instructions on pages 1-9.

OMB No. 1660-0008  
Expiration Date: July 31, 2015

### SECTION A – PROPERTY INFORMATION

FOR INSURANCE COMPANY USE

A1. Building Owner's Name		Policy Number:
A2. Building Street Address (including Apt., Unit, Suite, and/or Bldg. No.) or P.O. Route and Box No.		Company NAIC Number:
City	State	ZIP Code
A3. Property Description (Lot and Block Numbers, Tax Parcel Number, Legal Description, etc.)		
A4. Building Use (e.g., Residential, Non-Residential, Addition, Accessory, etc.)		
A5. Latitude/Longitude: Lat. _____ Long. _____ Horizontal Datum: <input type="checkbox"/> NAD 1927 <input type="checkbox"/> NAD 1983		
A6. Attach at least 2 photographs of the building if the Certificate is being used to obtain flood insurance.		
A7. Building Diagram Number _____		
A8. For a building with a crawlspace or enclosure(s):		A9. For a building with an attached garage:
a) Square footage of crawlspace or enclosure(s) _____ sq ft		a) Square footage of attached garage _____ sq ft
b) Number of permanent flood openings in the crawlspace or enclosure(s) within 1.0 foot above adjacent grade _____		b) Number of permanent flood openings in the attached garage within 1.0 foot above adjacent grade _____
c) Total net area of flood openings in A8.b _____ sq in		c) Total net area of flood openings in A9.b _____ sq in
d) Engineered flood openings? <input type="checkbox"/> Yes <input type="checkbox"/> No		d) Engineered flood openings? <input type="checkbox"/> Yes <input type="checkbox"/> No

### SECTION B – FLOOD INSURANCE RATE MAP (FIRM) INFORMATION

B1. NFIP Community Name & Community Number		B2. County Name		B3. State	
B4. Map/Panel Number	B5. Suffix	B6. FIRM Index Date	B7. FIRM Panel Effective/ Revised Date	B8. Flood Zone(s)	B9. Base Flood Elevation(s) (Zone AO, use base flood depth)
B10. Indicate the source of the Base Flood Elevation (BFE) data or base flood depth entered in Item B9: <input type="checkbox"/> FIS Profile <input type="checkbox"/> FIRM <input type="checkbox"/> Community Determined <input type="checkbox"/> Other/Source: _____					
B11. Indicate elevation datum used for BFE in Item B9: <input type="checkbox"/> NGVD 1929 <input type="checkbox"/> NAVD 1988 <input type="checkbox"/> Other/Source: _____					
B12. Is the building located in a Coastal Barrier Resources System (CBRS) area or Otherwise Protected Area (OPA)? <input type="checkbox"/> Yes <input type="checkbox"/> No Designation Date: _____ / _____ / _____ <input type="checkbox"/> CBRS <input type="checkbox"/> OPA					

# Why are Elevations Important?

## An Example from Galveston Bay, Texas



Home Finder

Search for REALTOR® listings that are for sale or lease

reliant  
an NRG company

MyHomeFinder Sponsored by Reliant Save Searches, Bookmark Homes, Email Alerts, Mobile App Sync for iPad, iPhone and Android SIGN UP

LOGIN

858 Signature Cove, League City, TX 77573 (Map It) Active on Market [View Property Website](#)

[Like](#) 0 [Share](#)

**\$1,028,697** Single Family Homes, 4 Beds, 3 Full & 1 Half Bath(s)

[Bookmark Listing](#) [Not Interested](#)

REALTOR® Agent



**Johnny Schiro**

[View Agent Phone](#)

[View Agent Web Site](#)

[Email Agent](#) | [My Profile](#)

Client Experience Rating ?

**4.90/5.0 Overall Rating**



[View Rating Details](#)

Based on 134 Completed Surveys

[View My Listings](#)

[View My Transactions](#)

[View My Blog](#)



**More Information**

[Schedule Showing](#)

[Email Agent](#)

[Email Company](#)

[Email a Friend](#)

[Send To Phone](#)

[Print Flyer](#)

**Tools / Research**

[Tax Information](#)

[Mortgage Calculator](#)

[Schools](#)

[Neighborhood](#)

[Electricity Bill Estimator](#)

[Translate It](#)

[Currency Converter](#)

[Add to Cart](#)

**MyCart** ( 0 Listings )

# An Example from Galveston Bay, Texas

From Google Street View



846 Davis Rd  
League City, TX 77573 - approximate address

STREET VIEW



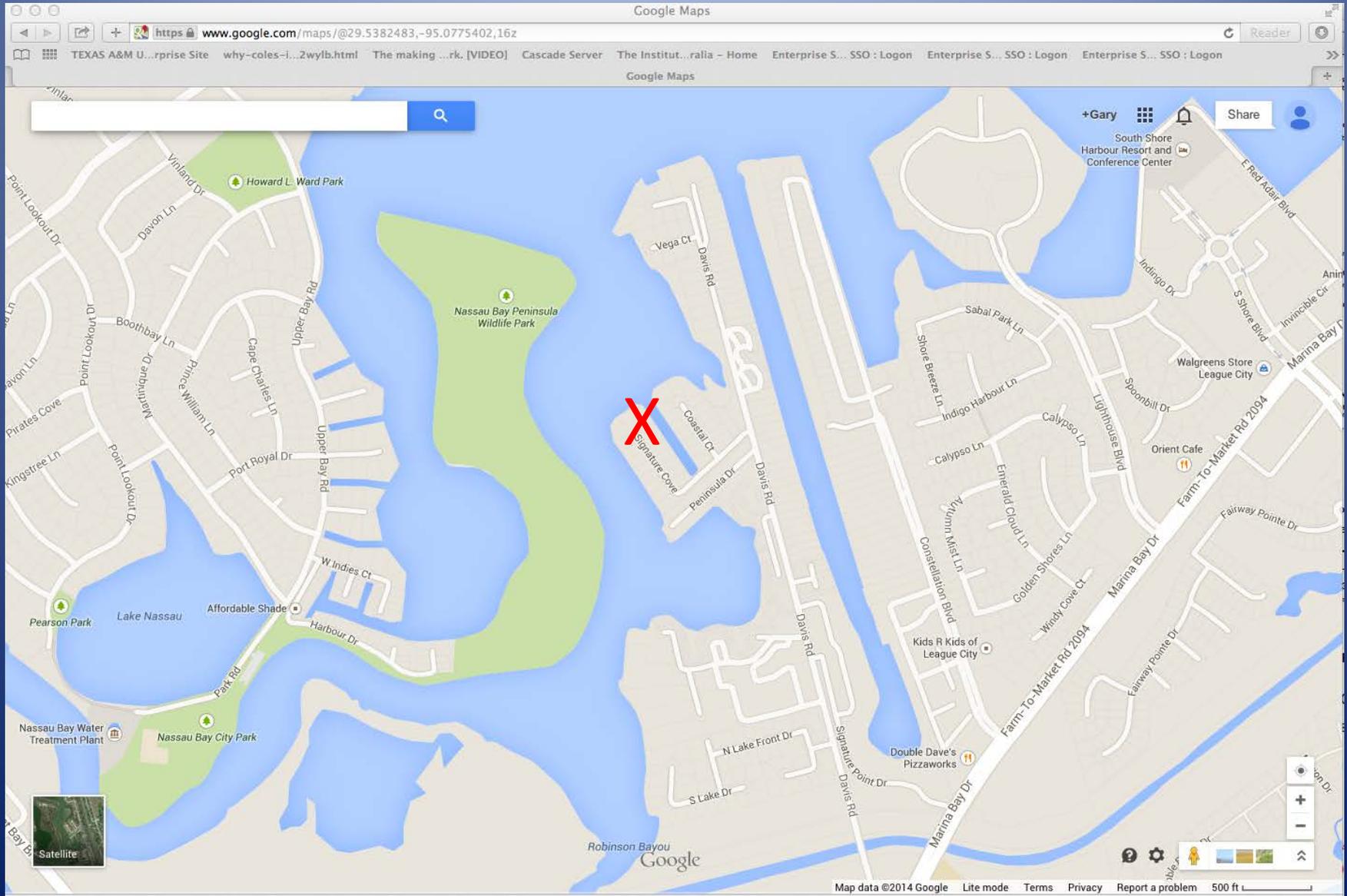
Hide imagery

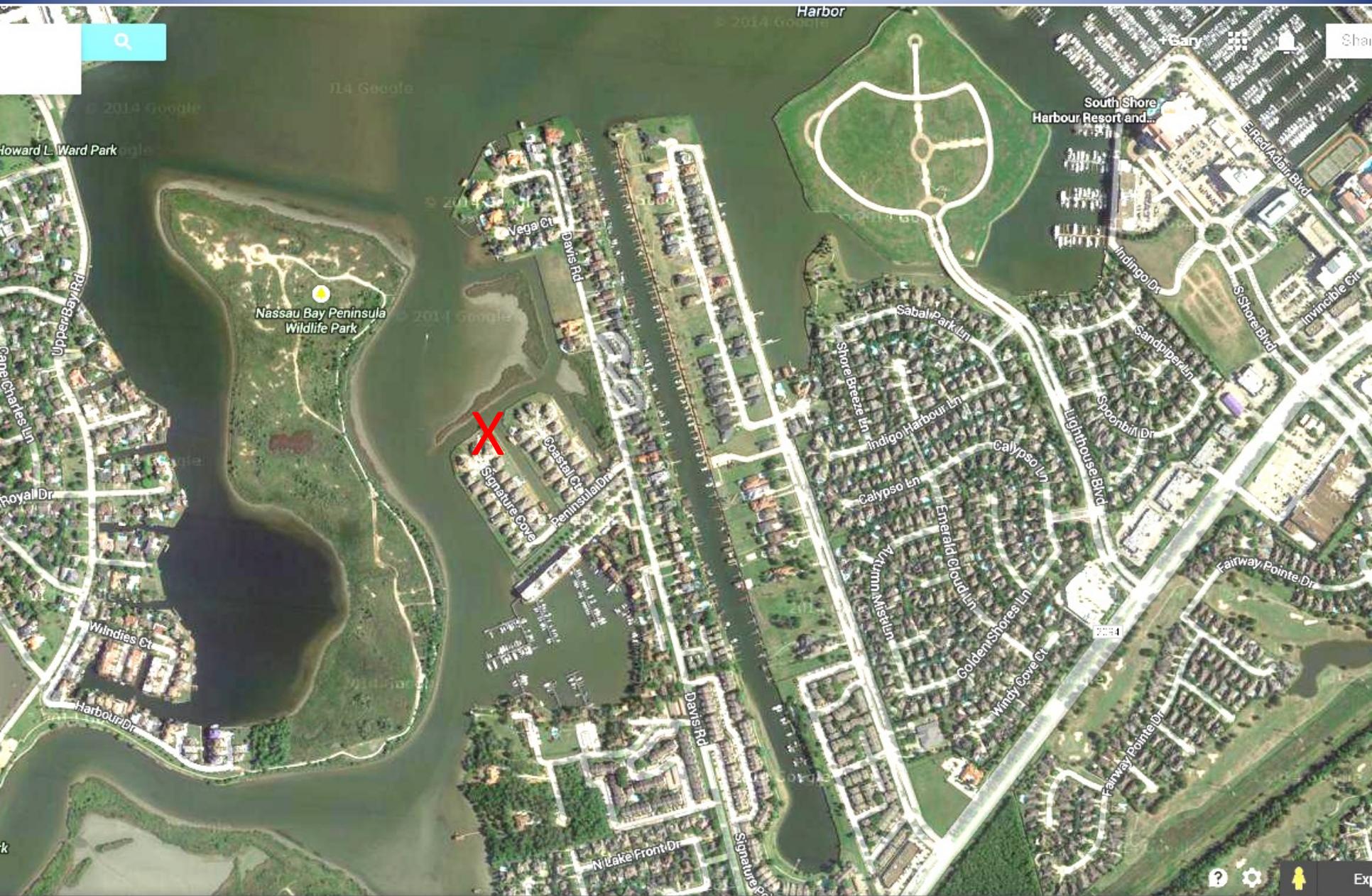
Back to Map

Google

# An Example from Galveston Bay, Texas

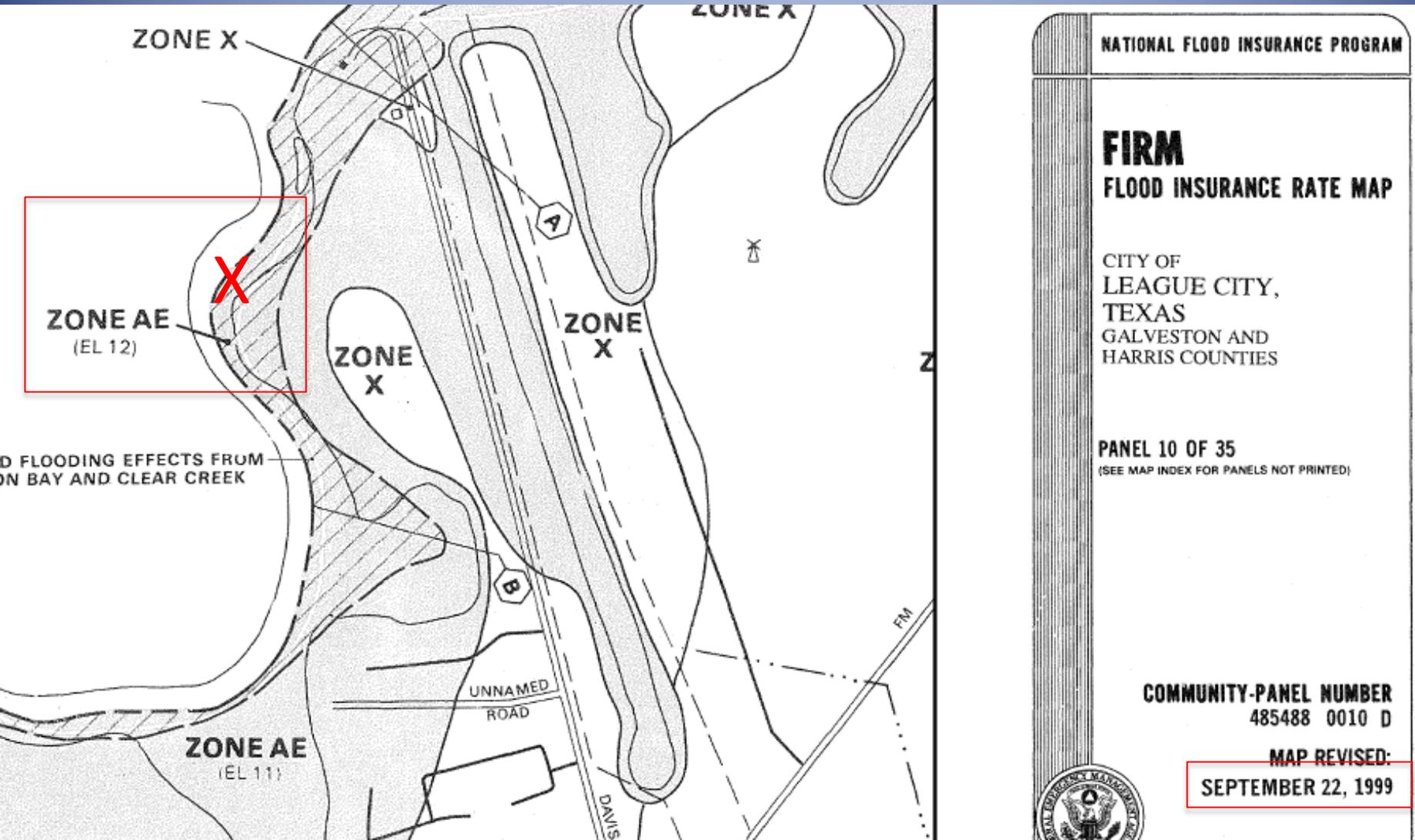
From Google Maps



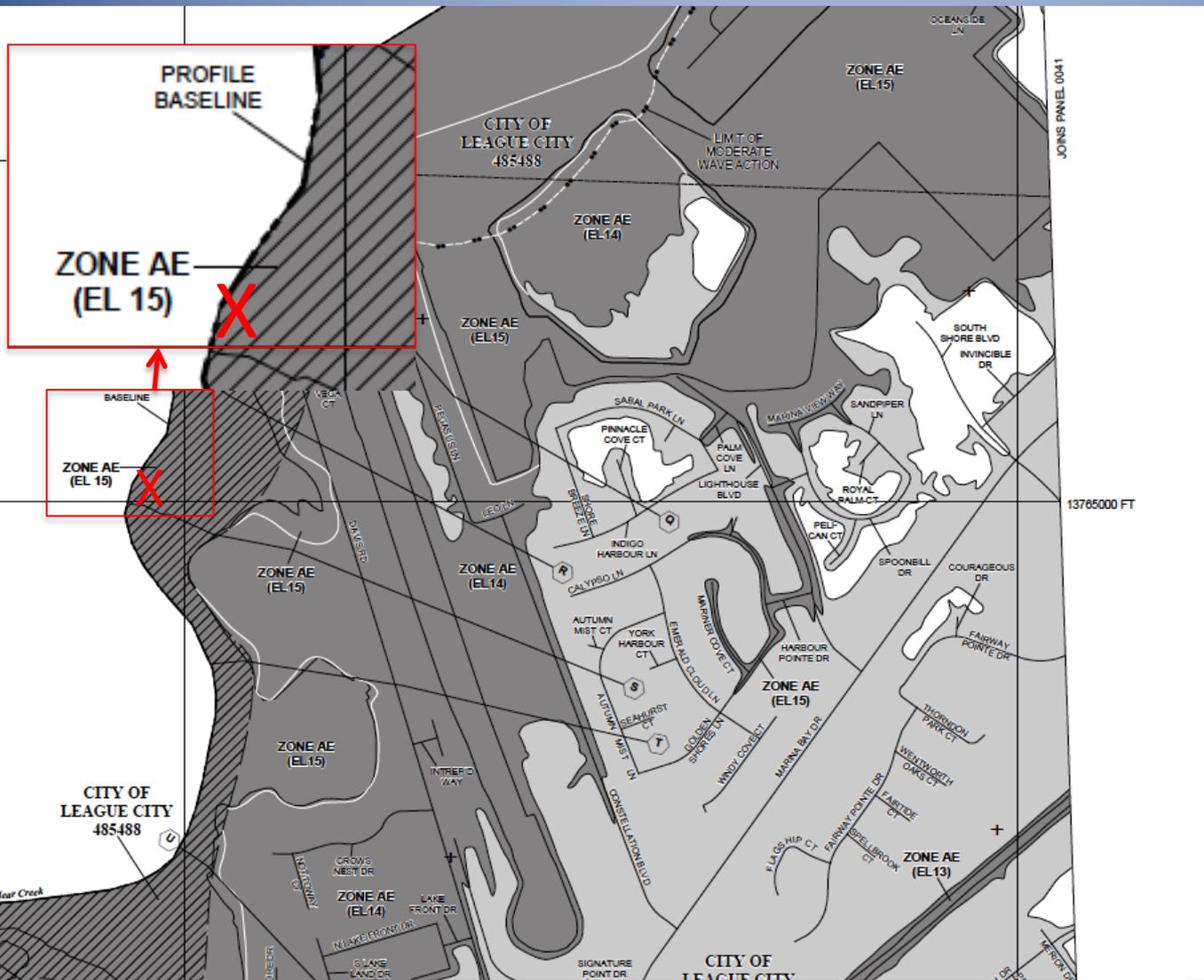


From: Google Maps Satellite Image

# An Example from Galveston Bay, Texas



# An Example from Galveston Bay, Texas



Bridge
   
 Footbridge

45° 02' 08", 93° 02' 12"  
 485<sup>th</sup> N  
 4989000 FT  
 DX5510 X  
 M1.5  
 River Mile

**MAP REPOSITORIES**  
 Refer to Map Repositories list on Map Index

**EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP**  
 EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

**MAP SCALE 1" = 500'**

**FLOOD INSURANCE PROGRAM**

PANEL 0037G

**FIRM**  
**FLOOD INSURANCE RATE MAP**

**GALVESTON COUNTY, TEXAS AND INCORPORATED AREAS**

PANEL 37 OF 600  
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

**CONTAINS:**

COMMUNITY	NUMBER	PANEL	SUFFIX
LEAGUE CITY, CITY OF	485488	0037	0

**PRELIMINARY**  
**SEP 27 2012**

Notice to User: The Map Number shown below





# Tidal Datum Relationship is Local

Datums for 8770613, Morgans Point TX

## Elevations on Station Datum

**Station:** 8770613, Morgans Point, TX

**T.M.:** 90

**Status:** Accepted (Jul 3 2013)

**Epoch:** 1983-2001

**Units:** Feet

**Datum:** STND

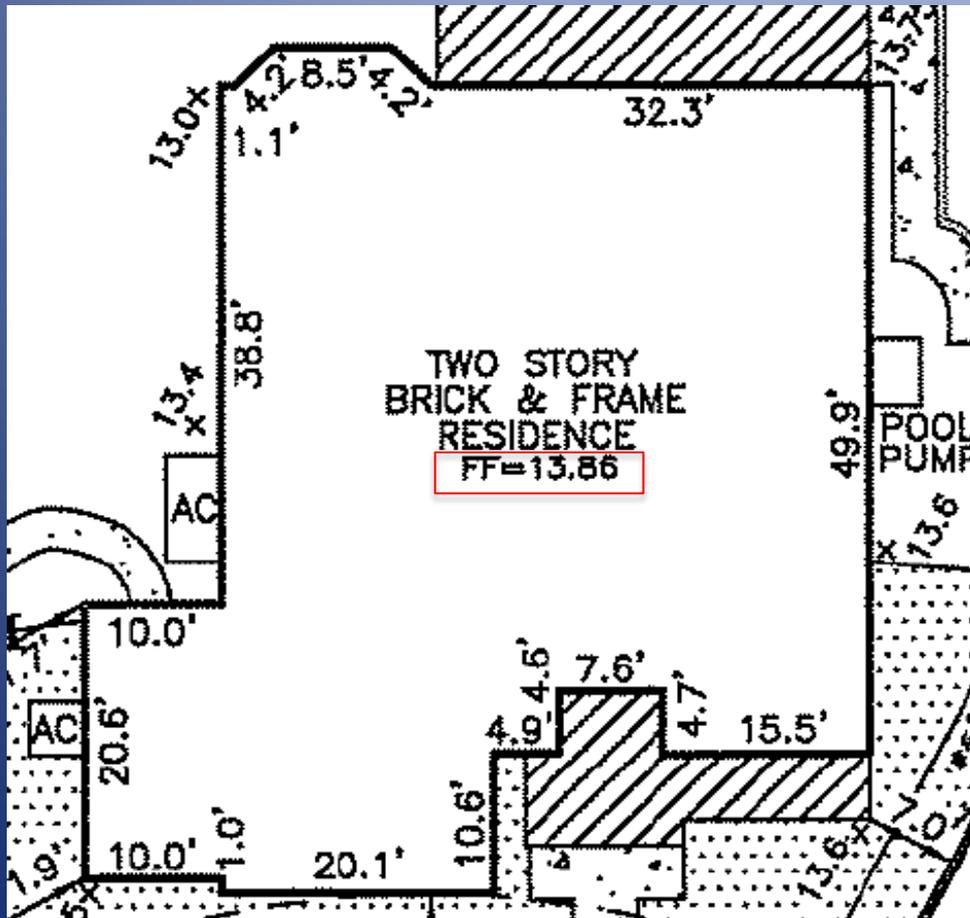
Datum	Value	Description
MHHW	6.53	Mean Higher-High Water
MHW	6.45	Mean High Water
MTL	5.89	Mean Tide Level
MSL	5.93	Mean Sea Level
DTL	5.87	Mean Diurnal Tide Level
MLW	5.33	Mean Low Water
MLLW	5.22	Mean Lower-Low Water
NAVD88	5.32	North American Vertical Datum of 1988
STND	0.00	Station Datum

MSL is higher than  
NAVD88

MSL = 0.61 ft  
NAVD88 datum

# An Example from Galveston Bay, Texas

MSL Datum  
-0.61 ft



FF = Finished Floor Level  
FF = 13.86 – 0.61 feet  
= 13.25 feet

FIRM September 1999  
Zone AE EL 12 = 12.00 feet

FIRM September 2012  
Zone AE EL 15 = 15.00 feet

# An Example from Galveston Bay, Texas

## Surveyor's Elevation Datum Control

BM: NGS BENCHMARK P.J.D. AW4847,  
STAMPED "Q1472-1983", A STAINLESS  
STEER ROD IN SLEEVE, LOCATED +/-215'  
SOUTHWEST OF THE INTERSECTION OF  
DICKINSON AVE AND WALKER STREET IN  
LEAGUE CITY, TX. ELEV=19.46, NAVD 1988,  
GEOID '09.

# Flood Insurance Quote

PREMIUM CALCULATIONS		
DEDUCTIBLE DECREASE	TOTAL AMOUNT	TOTAL ANNUAL PREMIUM
\$0	\$250,000	\$302
\$0	\$100,000	\$185
Annual Subtotal:		\$487
ICC Premium:		\$4
Sub Total:		\$491
CRS Discount: 20%		(\$98)
Reserve Fund Assessment:		\$20
Policy Fee:		\$44
Probation Surcharge:		\$0
Total Premium:		<b>\$457</b>

**FULL PREMIUM MUST ACCOMPANY APPLICATION**

ELEVATION INFO	Building Floodproofed: No		Base Flood Elevation: 11.4		Lowest Floor - Base Flood = Elevation Difference		
	Elevation Certificate Date: 4-5-2012	Date Photos Taken: 4-28-2014		Lowest Floor Elevation: 14.0	Next Higher Floor Elevation: 24.3	14.0	11.4
Building Diagram Number: A	Floodproofed Elevation:		Lowest Adjacent Grade: 12.7	Highest Adjacent Grade: 13.6			
Top of Bottom Floor Elevation:	Attached Garage Elevation: 13.4						

# For Sale \$1,028,697 ?

## 858 Signature Cove

League City, TX 77573-1526

SHARE 

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[Features](#)

[Photos/Docs](#)

[Property Tax](#)

[School](#)

[Map](#)

[Mortgage Calculator](#)

[Contact \(281\) 459-0117](#)





Thank you for listening.  
[gary.jeffress@tamucc.edu](mailto:gary.jeffress@tamucc.edu)