

SYLVESTER MURPHY SURVEY
ABSTRACT NUMBER 53

BAY AREA BOULEVARD
(WIDTH VARIES)

TSARP MON. NO. 020150
X=3209280.17 FEET
Y=13782479.40 FEET
X=1155340.861 VARAS
Y=4961692.584 VARAS

TSARP MON. NO. 020015
X=3210547.09 FEET
Y=13785180.01 FEET
X=1155796.952 VARAS
Y=4962657.604 VARAS
ELEV=12.21 NAVD'88
(2001ADJ TSARP)

X=3210697.28 FEET
Y=13785149.23 FEET
X=1155851.022 VARAS
Y=4962653.721 VARAS

MEANDER LINE OF MEAN
HIGHER HIGH WATER ON
OCTOBER 11, 2007

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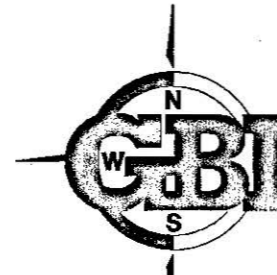
MEANDER LINE OF MEAN
HIGHER HIGH WATER ON
OCTOBER 11, 2007

X=3211197.05 FEET
Y=13784412.76 FEET
X=1156030.937 VARAS
Y=4962388.595 VARAS

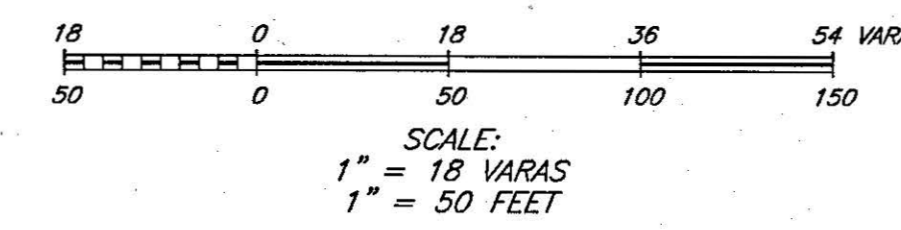
| LINE | BEARING | DISTANCE FEET | DISTANCE VARAS |
|------|---------------|---------------|----------------|
| L1 | N 57°59'57" W | 48.61' | 17.500 VS |
| L2 | N 61°18'34" W | 31.92' | 11.490 VS |
| L3 | N 71°25'08" W | 41.71' | 15.014 VS |
| L4 | N 79°37'10" W | 23.94' | 8.617 VS |
| L5 | S 87°36'56" W | 45.49' | 16.376 VS |
| L6 | S 85°48'28" W | 28.64' | 10.311 VS |
| L7 | N 57°50'19" W | 40.41' | 14.547 VS |
| L8 | N 17°02'17" W | 29.47' | 10.609 VS |
| L9 | N 01°33'27" W | 27.87' | 10.034 VS |
| L10 | N 03°00'52" W | 25.05' | 9.019 VS |
| L11 | N 66°41'47" E | 12.55' | 4.518 VS |
| L12 | N 44°30'57" W | 10.27' | 3.697 VS |
| L13 | N 00°08'16" E | 40.95' | 14.740 VS |
| L14 | N 13°12'59" E | 27.22' | 9.799 VS |
| L15 | N 17°19'01" E | 28.72' | 10.341 VS |
| L16 | N 07°56'47" E | 30.08' | 10.827 VS |
| L17 | N 13°24'49" E | 30.16' | 10.856 VS |

| LINE | BEARING | DISTANCE FEET | DISTANCE VARAS |
|------|---------------|---------------|----------------|
| L18 | N 31°40'12" E | 20.80' | 7.490 VS |
| L19 | N 33°14'49" E | 31.94' | 11.497 VS |
| L20 | N 57°56'59" W | 10.19' | 3.667 VS |
| L21 | N 24°07'58" E | 37.03' | 13.331 VS |
| L22 | N 70°48'40" E | 10.61' | 3.820 VS |
| L23 | N 32°58'55" W | 8.63' | 3.106 VS |
| L24 | N 26°55'24" E | 32.22' | 11.598 VS |
| L25 | N 11°33'05" E | 27.91' | 10.047 VS |
| L26 | N 17°30'11" E | 30.83' | 11.099 VS |
| L27 | N 17°43'53" E | 12.38' | 4.457 VS |
| L28 | S 80°18'47" W | 17.84' | 6.423 VS |
| L29 | S 58°40'02" W | 17.39' | 6.260 VS |
| L30 | S 42°47'39" W | 26.93' | 9.694 VS |
| L31 | S 44°48'33" W | 24.98' | 8.991 VS |
| L32 | S 65°18'25" W | 25.80' | 9.289 VS |
| L33 | N 77°51'02" W | 24.30' | 8.747 VS |
| L34 | S 84°18'06" W | 45.81' | 16.491 VS |

| LINE | BEARING | DISTANCE FEET | DISTANCE VARAS |
|------|---------------|---------------|----------------|
| L35 | N 88°22'44" W | 30.18' | 10.864 VS |
| L36 | N 62°55'40" W | 22.57' | 8.124 VS |
| L37 | N 06°37'34" W | 22.86' | 8.229 VS |
| L38 | N 04°51'00" E | 13.07' | 4.704 VS |
| L39 | N 03°59'25" W | 20.24' | 7.286 VS |
| L40 | N 51°14'25" W | 9.64' | 3.470 VS |
| L41 | S 86°17'34" W | 26.52' | 9.546 VS |
| L42 | N 75°42'07" W | 25.34' | 9.121 VS |
| L43 | N 62°11'06" W | 24.54' | 8.833 VS |
| L44 | N 38°23'47" W | 27.00' | 9.719 VS |
| L45 | N 28°59'56" W | 27.74' | 9.985 VS |
| L46 | N 13°21'03" W | 27.40' | 9.883 VS |
| L47 | N 09°36'48" W | 24.54' | 8.835 VS |
| L48 | N 34°23'36" W | 27.64' | 9.951 VS |
| L49 | N 07°38'17" E | 21.79' | 7.845 VS |
| L50 | N 15°50'00" W | 28.70' | 10.334 VS |
| L51 | N 06°41'44" E | 23.38' | 8.416 VS |



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TEXAS GENERAL LAND OFFICE
Art. 33.136, Natural Resources Code
Co. Harris, State No. 11
File Date October 11, 2007

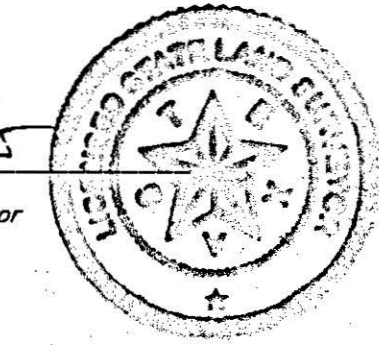
NOTE:
1) All coordinates and bearings shown hereon are grid values referenced to the Texas Coordinate System of 1983, South Central Zone, and TSARP Monument "020015". All distances shown hereon are surface distances unless noted and may be converted to grid distances by multiplying by a scale factor of 0.999877289. The mapping angle for this project is 01°54'54\".

NOTICE:
This survey was performed in accordance with Section 33.136, Natural Resources Code, for the purpose of evidencing the location of the shoreline in the area depicted in this survey as that shoreline existed before commencement of erosion response activity, as required by Chapter 33, Natural Resources Code. The meander line depicted on this survey fixes the shoreline for the purpose of locating a shoreline boundary, subject to movement landward as provided by Section 33.136, Natural Resources Code.

I, William E. Merten, Licensed State Land Surveyor in and for the State of Texas, do hereby certify that on October 11, 2007, I have located the natural contour line of Mean Higher High Water on the ground, according to law and with the personnel stated, and that the meanders of said contour line are true and correct as shown hereon. To the best of my knowledge, no artificial fill or any development, other than as shown hereon, that would cause alteration to said contour line has occurred within the area surveyed. Reference is hereby made to the accompanying report by me of the same date.

Field Personnel:
Josh McGinn
Nick Vann

William E. Merten
William E. Merten
Licensed State Land Surveyor



**SURVEY OF
MEAN HIGHER HIGH WATER
ALONG ARMAND BAYOU
ADJACENT TO THE
DAVID HARRIS SURVEY,
ABSTRACT NUMBER 25
HARRIS COUNTY, TEXAS**

PROJECT NO. 075561

DATE: OCTOBER 22, 2007
REV: MARCH 23, 2009 ADD
MAPPING ANGLE AND REV
NORTH COORDINATE

SHEET 1 OF 1



**Survey Division
Coastal Boundary Survey Approval**

Project: Bay Area Park / Armand Bayou

Project No: CL20070005 (GLO)

Project Manager: Crouch Environmental Services, Inc.
402 Teetshorn Street
Houston, Texas 77009
(Surveyor – William Merten, LSLs)

Description: Mean Higher High Water Line survey of a portion of the east shoreline of Armand Bay on the west boundary of the David Harris Survey, Abstract 25, at Bay Area Park, south of Bay Area Boulevard, Harris County, Texas.

A Coastal Boundary Survey for the above-referenced project has been reviewed and accepted; upon completion of public notice requirements, the survey will be filed in the Texas General Land Office, Archives and Records, in accordance with provisions of the *Texas Natural Resources Code*, Chapter 33.136.

Approved:

Signed: David A. Pyle 4/17/2009
Survey Division Date

Approval Filed as:

Tex. Nat. Res. Code Article 33.136 Harris ^{Sketch} County Report No. 11
RK

TEXAS GENERAL LAND OFFICE
Art. 33.136, Natural Resources Code
Co. Harris, Sketch No. 11
File Date 06/20/2018 by R. Kartye

SURVEYORS REPORT
SURVEY OF MEAN HIGHER HIGH WATER ALONG A PORTION OF
ARMAND BAYOU ADJACENT TO THE DAVID HARRIS SURVEY
HARRIS COUNTY, TEXAS

At the request of the Crouch Environmental Services, Inc. and in my capacity as a Licensed State Land Surveyor in Texas, I have determined the line of Mean Higher High Water (Littoral Boundary) for Armand Bayou along a portion of the David Harris Survey, Abstract Number 25, in Harris County, Texas. This survey was performed as per the requirements outlined in the Coastal Public Lands Management Act of 1973, as amended, Chapter 33, Natural Resources Code, and specifically per Section 33.136, Natural Resources Code, "Property Rights: Preservation of Littoral Rights".

The purpose of this survey was to evidence "...the location of the shoreline in the area depicted in this survey as that shoreline existed before commencement of erosion response activity..."(Section 33.136(b), Natural Resources Code).

The David Harris Survey borders along the east bank of Armand Bayou and title was received from the Mexican Government on November 20, 1832. This portion of Armand Bayou is a tidally influenced Bayou that which empties into Clear Lake, which in turn empties into Galveston Bay. The project is located on the south side of the Bay Area Boulevard eastbound bridge crossing of the bayou.

In the case of Humble Oil & Refining Co. vs. Sun Oil Co. (190 F 2d 191), the court held that "grants issued by the King of Spain and the Mexican State before the adoption of common law in Texas, the boundary between sea and upland must be determined in accordance with principals announced in Las Siete Partidas, the basic law of Spain and Mexico which defines "shore" as all ground covered with water at high tide during the whole year, whether in winter or summer."

In a decision by the Texas Supreme Court in the case of Luttes vs. State (324 SW 2nd 167, on remand 328 SW 2nd 920) it was found that the littoral boundaries for civil law grants differs from the boundaries of common law grants. The court states that for civil law grants (grants by Spain and Mexico) the boundary is the line of Mean Higher High Water (MHHW) and for common law grants (grants made by the Republic and State of Texas) the boundary is the line of Mean High Water (MHW). This case described that the best method of determining MHHW and MHW is to employ the use of scientific tide gauges.

The Luttes case defined MHHW as a tidal datum that is the average of the higher of the two daily tides observed over a specific 19 year period (epoch) and MHW as a tidal datum that is the average of all high tides over a specific 19 year period (epoch). Tides being defined as the regular and predictable rise and fall in sea level due to the gravitational pull of the sun and moon.

TEXAS GENERAL LAND OFFICE
Art. 33.136, Natural Resources Code
Co. Harris, Sketch No. 11
File Date 06/20/2013 by R. Kurtze

Also, sea levels are influenced by weather conditions, geographical location and topography of the coastline. The combination of these conditions can result in a wide variation in the elevation of the tidal datum from location to location.

Due to this variation, the tidal datum had to be determined at the project location. Because of the impracticality of obtaining 19 years of tide readings at a specific location, methods have been developed to correct short term observations between project site staff gauges and a primary tide gauge (gauges with more than 19 years of observations).

Tide gauges along the Texas coastline are installed, operated and maintained by a joint effort involving the National Oceanic and Atmospheric Administration (NOAA), the Conrad Blucher Institute (CBI) and Lamar University. Tidal datum's, benchmarks and gauge readings are published and available from NOAA and CBI.

The project site is located in close proximity of the Clear Lake Tide Gauge, a secondary gauge referenced to the Galveston Pier 21 Tide Gauge, a primary gauge in use since 1908. Recently, NOAA has adopted new procedures to compute accepted tidal datum's in the Galveston area based on more recent observations. This procedural change is due to the rise in sea level in the Galveston area, being over 0.02 feet per year, which far exceeds the U.S. average rise of 0.005 feet per year. Currently the published tidal datum for the two gauges is based on the 19-year epoch from 1983 to 2001. Due to this relatively rapid change in sea level I felt it was necessary to compute data on a more current epoch in lieu of using the published datum's. A new tidal datum for the Galveston Pier 21 Tide Gauge was calculated for the 19-year epoch ending in August, 2007, and using the standard method, the Clear Lake Tide Gauge was adjusted to this same epoch.

A site staff gauge was installed and observed simultaneously with the Clear Lake Tide Gauge for four days (eight high tide cycles). These reading were compared to the Clear Lake Tide Gauge using the amplitude ratio method resulting in a calculated elevation for mean higher high water at the site staff gauge.

The project site is located at Bay Area Park and located on the east bank of Armand Bayou just south of Bay Area Boulevard. The location is approximately 480 varas (1,333 feet) of the bank in length, adjacent to a parking/canoe launch area which is part of the park facilities.

On October 11, 2007 points were located on the line of Mean Higher High Water along the shoreline for the entire project length. These points were incorporated into surveyed meanders delineating the littoral boundary between the State owned seabed of Armand Bayou and the privately owned uplands.

The surveyed meander line was tied to the Harris County TSARP Monumentation System (Texas Coordinate System of 1983, South Central Zone) using TSARP Monument Number "020015" for reference. The scale factor used for this project is 0.999877289.

To the best of my knowledge no artificial fill or development, other than previously stated, that would cause alteration to the line of mean higher high water, has occurred within the area surveyed.

A plat showing the results of this survey was prepared and accompanies this report.

Respectfully submitted,



William E. Merten
Licensed State Land Surveyor
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Houston, Texas 77031
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Project No. 075561
Date: October 22, 2007