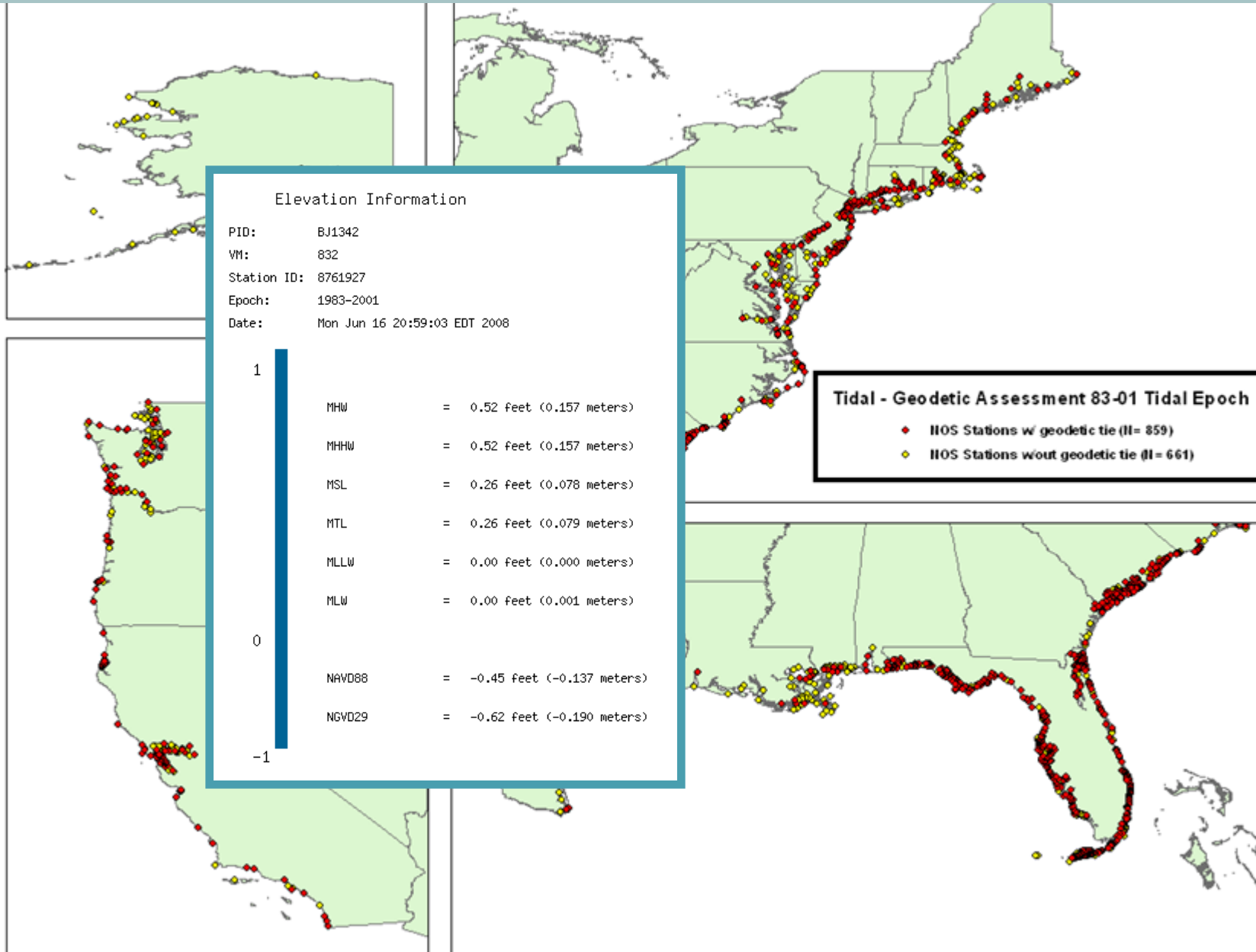


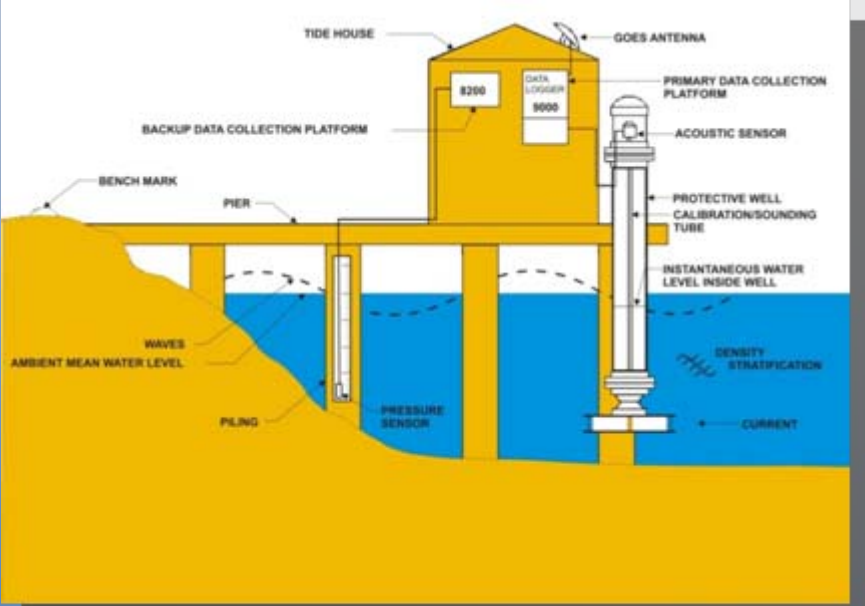
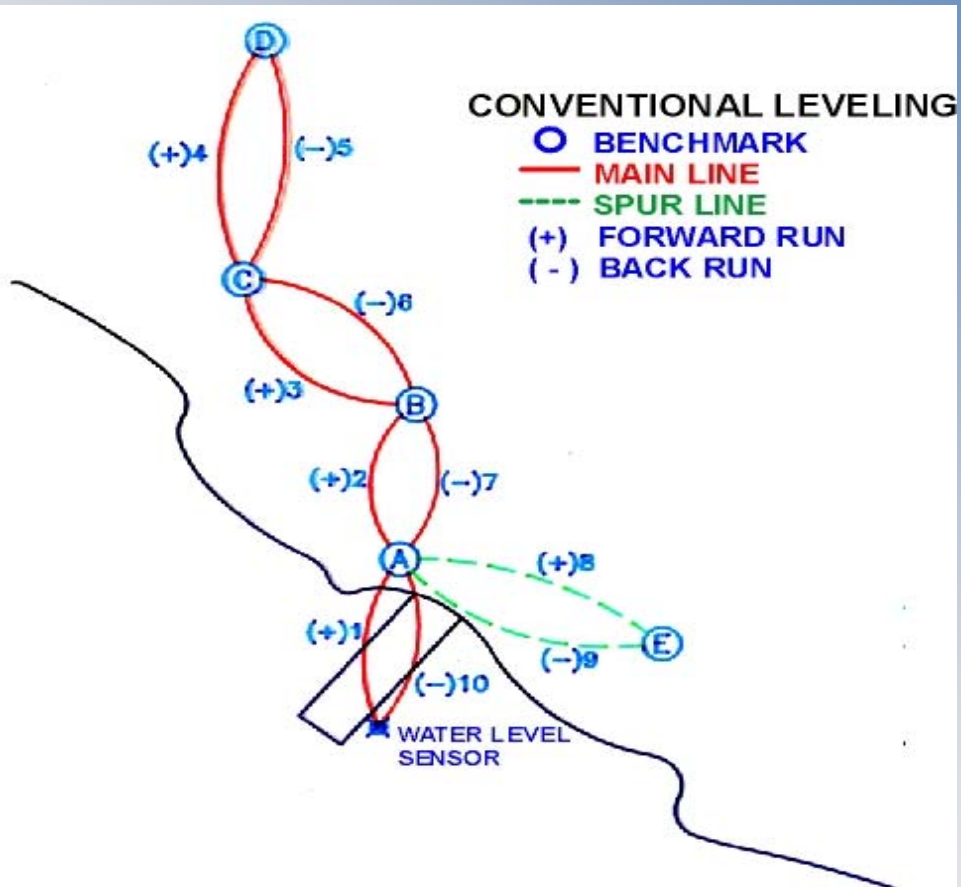
Tidal and Geodetic Datums

Tidal and Geodetic Relationships

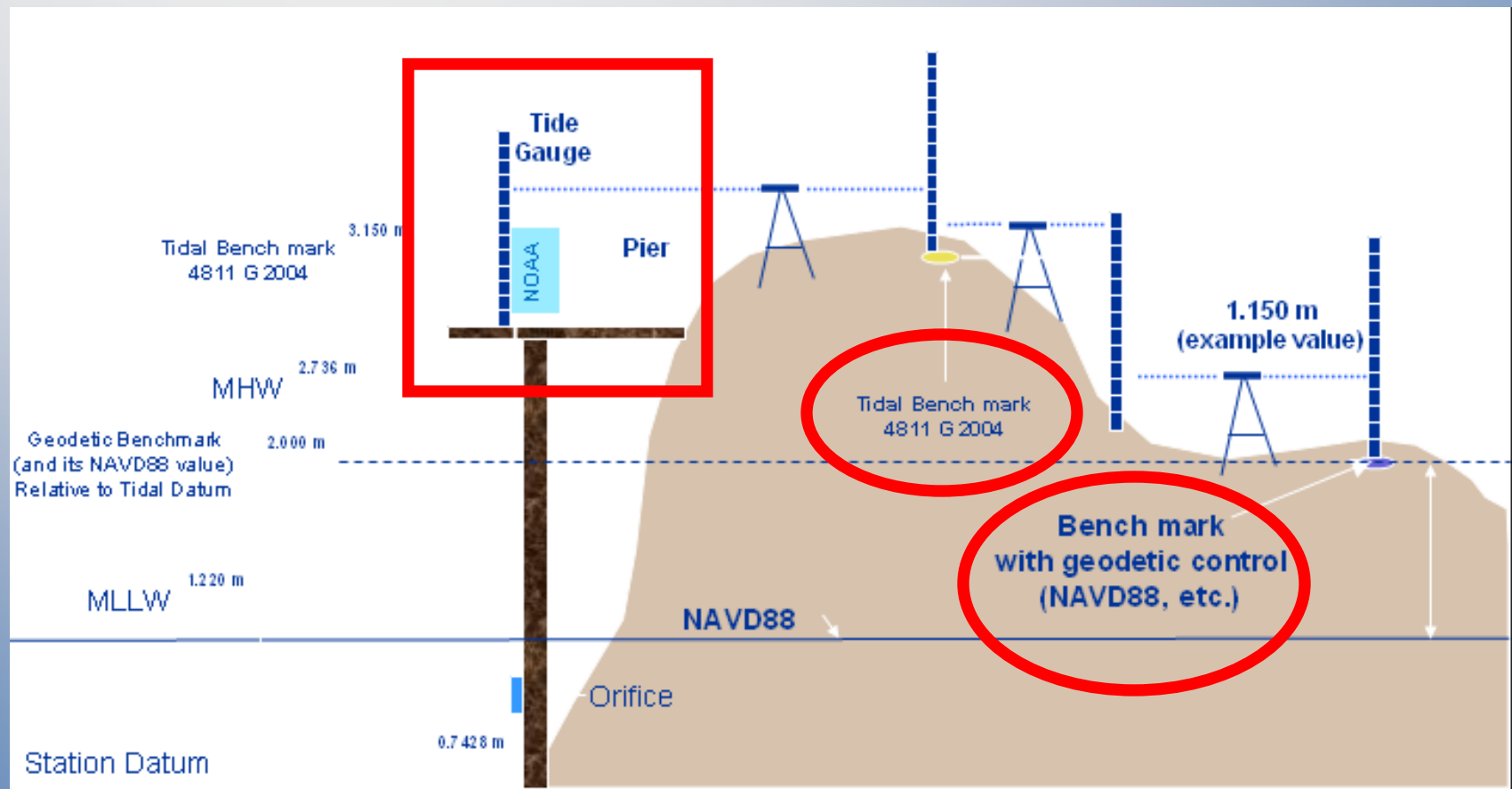
Tidal Datums Team
nos.coops.datums@noaa.gov



Ensuring Vertical Stability and Establishing Geodetic Connections



Ensuring Vertical Stability and Establishing Geodetic Connections



Benchmark Elevation Information

The screenshot shows the NOAA Tides and Currents website interface. At the top left is the NOAA logo and the text "TIDES & CURRENTS". A search bar is located at the top right. Below the search bar is a navigation menu with the following items: Home, Products, Programs, Partnerships, Education, and Help. The "Products" menu is expanded, showing a list of categories: Tides, Great Lakes Water Level, Currents, Meteorological Observations, Conductivity, Bench Marks, Storm QuickLook, Datums, Harmonic Constituents, System, PORTS - Real Time Obs., Sea Level Trends, Astronomical Data, nowCOAST, Publications, IOOS Data Portal, Request Products, HAB - Harmful Algal Blooms, and Google Earth/KML Files. The "Bench Marks" category is highlighted in blue, and a sub-menu is open showing "Present Epoch (1983-2001)" and "Superseded Epoch (1960-1978)".

Center for Coastal Oceanographic Products and Services
Turning open ocean data into meaningful information for the

Click map to access data and products

CO-OPS provides the national infrastructure, science, and technical expertise to monitor, assess, and distribute tide, current, water level, and other coastal oceanographic products and services that support NOAA's mission of environmental stewardship and environmental assessment and prediction. CO-OPS provides operationally sound observations and monitoring capabilities coupled with operational Nowcast Forecast modeling.

News and Alerts

- [2008-11-04] 2009 Tide Predictions are now online!
- [2008-11-04] 2009 Current Predictions are now online!
- [2008-09-26] Hurricane Gustav Water Levels and Meteorological Data Report is now available on the publication page (PDF)

Tides/Water Levels

- Preliminary Data
 - Coastal Stations
 - Great Lakes
- Verified Data
 - Coastal Stations
 - Great Lakes
- 1 min. Water Level Data
- Tide Tables
- Graphical Predictions
- Harmonic Constituents
- Datums
 - Present Epoch
 - Superseded

PORTS

- PORTS
- Select a PORT
- MyPORTS: Create a Custom View^{new!}

Currents

- Current Observations
- Tidal Current Tables

Meteorological/Other

- Wind, Air/Water temp, Barometric
 - Observations
- Conductivity
 - Observations
- Astronomical Data

Operational Forecast Systems

- OFS
- Select an OFS

<http://www.tidesandcurrents.noaa.gov>



Benchmark Elevation Information

New Canal Station, LA
Station ID: 8761927

New Canal Station, LA: [Data Inventory](#)
[Page Help](#)

Bench Mark Sheets

Click [HERE](#) for printable version

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service

Datums Page

Page 1 of 8

Station ID: 8761927 PUBLICATION DATE: 02/04/2009
Name: USCG NEW CANAL STA., LAKE PONTCHARTRAIN
LOUISIANA
NOAA Chart: 11369 Latitude: 30° 1.6' N
USGS Quad: SPANISH FORT Longitude: 90° 6.8' W

To reach the station from the junction of Interstate Highway 10 and Causeway Boulevard, go north for 0.95 km (0.95 mi) on Causeway Boulevard to Veterans Memorial Highway. Turn right and go east for 3.89 km (2.40 mi) on Veterans Memorial Boulevard to Ponchartrain Boulevard. Turn left and go north for 1.85 km (1.15 mi) on Ponchartrain Boulevard to Robert E Lee Boulevard. Continue straight ahead and go north for 0.72 km (0.45 mi) on Robert E. Lee Boulevard to the old Coast Guard Station on the left at the east end of a curve in the road. Turn left onto a narrow lane for 30 m (98.4 ft) to the station on the right.

Location of Tide Gauge

T I D A L B E N C H M A R K S

T I D A L B E N C H M A R K S

PRIMARY BENCH MARK STAMPING: 10
DESIGNATION: 10

MONUMENTATION: Survey disk
AGENCY: US Coast Guard (USCG)
SETTING CLASSIFICATION: Concrete bulkhead

VM#: 817
PID#: AT0687

The primary bench mark is a disk set in top of a concrete sea wall at the Coast Guard Station, 7.92 m (26.0 ft) SSW of the north end of the concrete boat ramp, 6.61 m (21.7 ft) NNW of the NW corner of the boat house, and 6.0 m (5.2 ft) SE of the east side of the small boat ramp.

BENCH MARK STAMPING: 13 1975
DESIGNATION: 876 1724 TIDAL 3

VM#: 821
PID#: AT0688

T I D A L D A T U M S

Tidal datums at USCG NEW CANAL STA., LAKE PONTCHARTRAIN based on:

LENGTH OF SERIES: 3 YEARS
TIME PERIOD: January 2006 - December 2008
TIDAL EPOCH: 1983-2001
CONTROL TIDE STATION: 8747437 BAY WAVELAND YACHT CLUB, BAY ST. LOUIS

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in METERS:

HIGHEST OBSERVED WATER LEVEL (09/13/2008) = 1.670
MEAN HIGHER HIGH WATER (MHHW) = 0.151
MEAN HIGH WATER (MHW) = 0.151
MEAN TIDE LEVEL (MTL) = 0.075
MEAN SEA LEVEL (MSL) = 0.075
MEAN LOW WATER (MLW) = 0.000
MEAN LOWER LOW WATER (MLLW) = 0.000
LOWEST OBSERVED WATER LEVEL (12/25/1989) = -0.782

National Geodetic Vertical Datum (NGVD 29)

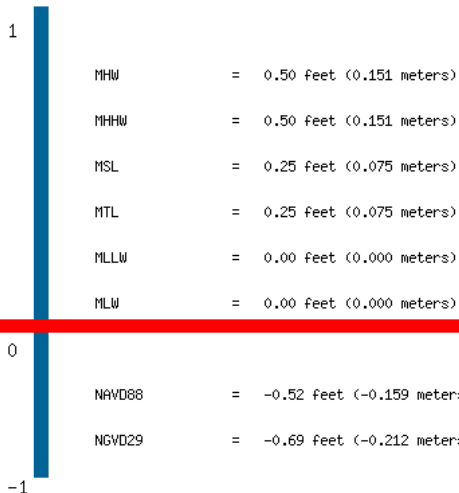
Bench Mark Elevation Information in METERS GEOID:

Stamping or Designation	MLLW	MHW
ALCO 1931	1.849	1.698
1927 A 1982	1.596	1.445
ALCO 1931 RM	1.759	1.608
V 148 1951	1.997	1.846
1927 B 1982	1.668	1.517
X 374 1985	1.554	1.403
1927 D 2005	1.868	1.717
1927 E 2005	1.887	1.736
1927 F 2006	1.827	1.676
1927 G 2006	1.909	1.758
1927 H 2006	1.423	1.272

Coast Guard
70 m (97.4 ft)
NW end of the

Elevation Information

PID: BJ1342
VM: 832
Station ID: 8761927
Epoch: 1983-2001
Date: Sun Mar 22 12:15:28 EDT 2009



Geodetic relationship based on one mark

The NAVD 88 and the NGVD 29 elevations related to MLLW were computed from Bench Mark, ALCO, at the station.

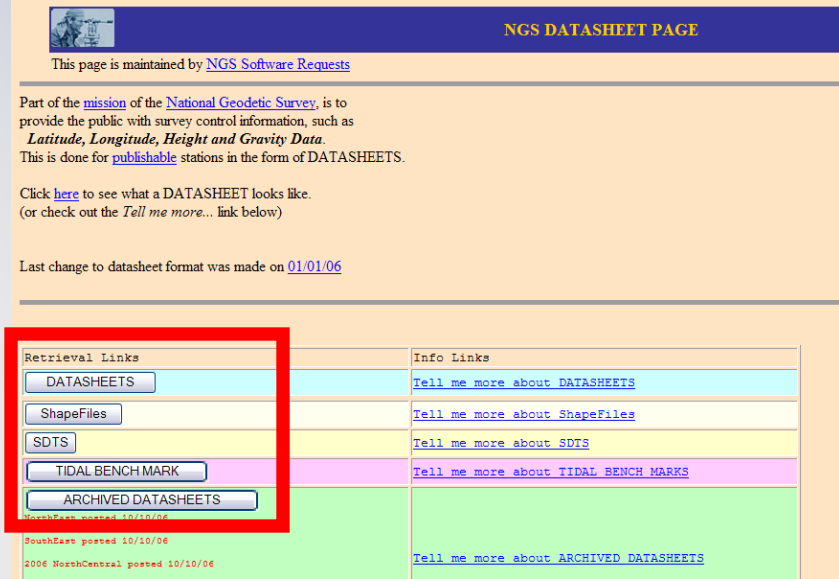


Getting datasheets from NGS website

Start at: www.ngs.noaa.gov which is the NGS home page.

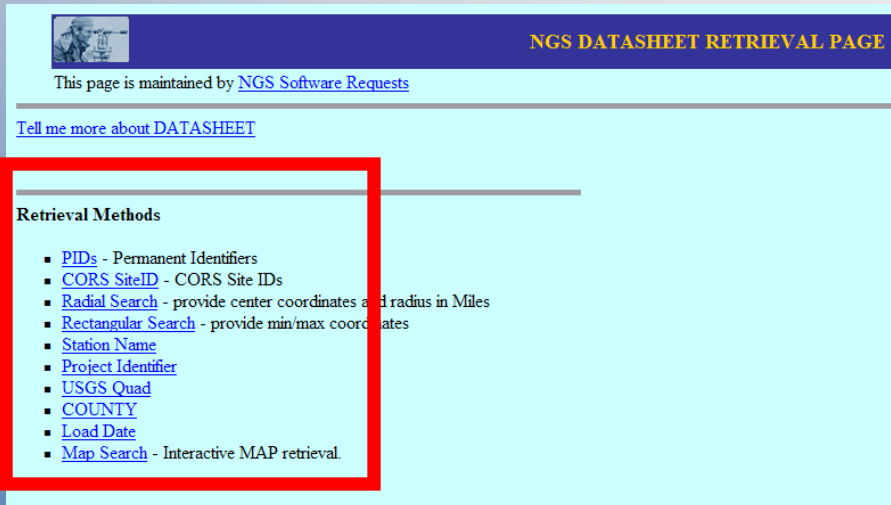


The screenshot shows the NGS home page with the National Geodetic Survey logo and navigation links. A search bar is visible with the text "aeronautical data", "CORS / GPS data", "USPUS data", "datasheets", "geodetic", "download software", and "Find a Survey Mark" highlighted in red. The date "Tuesday, April 24, 2007" is displayed, along with an "Upcoming Events" section titled "Check these out..." and a news item about the NGS 10 year plan.



The screenshot shows the "NGS DATASHEET PAGE" with a navigation bar and a table of retrieval links. The "Retrieval Links" table has a red box around the "DATASHEETS" and "ARCHIVED DATASHEETS" rows. The "Info Links" table provides links to "Tell me more about" various data types.

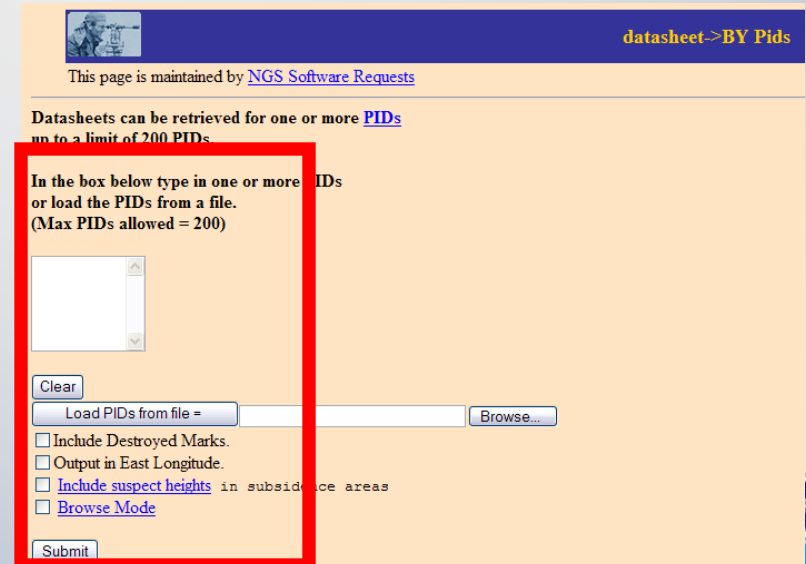
Retrieval Links	Info Links
DATASHEETS	Tell me more about DATASHEETS
ShapeFiles	Tell me more about ShapeFiles
SDTS	Tell me more about SDTS
TIDAL BENCH MARK	Tell me more about TIDAL BENCH MARKS
ARCHIVED DATASHEETS	Tell me more about ARCHIVED DATASHEETS



The screenshot shows the "NGS DATASHEET RETRIEVAL PAGE" with a navigation bar and a "Retrieval Methods" section highlighted in red. The section lists various search methods: PIDs, CORS SiteID, Radial Search, Rectangular Search, Station Name, Project Identifier, USGS Quad, COUNTY, Load Date, and Map Search.

Retrieval Methods

- [PIDs](#) - Permanent Identifiers
- [CORS SiteID](#) - CORS Site IDs
- [Radial Search](#) - provide center coordinates and radius in Miles
- [Rectangular Search](#) - provide min/max coordinates
- [Station Name](#)
- [Project Identifier](#)
- [USGS Quad](#)
- [COUNTY](#)
- [Load Date](#)
- [Map Search](#) - Interactive MAP retrieval.



The screenshot shows the "datasheet->BY Pids" form with a navigation bar and a "Retrieval Methods" section highlighted in red. The form includes a text input field for PIDs, a "Clear" button, a "Load PIDs from file" button with a "Browse..." button, and several checkboxes for search options.

Retrieval Methods

In the box below type in one or more PIDs or load the PIDs from a file. (Max PIDs allowed = 200)

Include Destroyed Marks.

Output in East Longitude.

[Include suspect heights](#) in subsidence areas

[Browse Mode](#)



Example of Unstable Benchmark Information

Grand Isle 8761724

T I D A L B E N C H M A R K S

PRIMARY BENCH MARK STAMPING: 10
DESIGNATION: 10

MONUMENTATION: Survey disk
AGENCY: US Coast Guard (USCG)
SETTING CLASSIFICATION: Concrete bulkhead

VM#: 817
PID#: AT0687

The primary bench mark is a disk set in top of a concrete sea wall at the Coast Guard Station, 7.92 m (26.0 ft) SSW of the north end of the concrete boat ramp, 6.61 m (21.7 ft) NNW of the NW corner of the boat house, and 1.60 m (5.2 ft) SE of the east side of the small boat ramp.

BENCH MARK STAMPING: 13 1975
DESIGNATION: 876 1724 TIDAL 13

MONUMENTATION: Tidal Station disk
AGENCY: National Ocean Survey (NOS)
SETTING CLASSIFICATION: Concrete bulkhead

VM#: 821
PID#: AT0688

The bench mark is a disk set in top of a concrete bulkhead at the Coast Guard Station, 44.99 m (147.6 ft) NW of the NW face of a boat house, 29.70 m (97.4 ft) SW of the extended center of the road, 9.90 m (32.5 ft) SE of the NW end of the concrete bulkhead, and 0.30 m (1.0 ft) above the level of the road.



Example of Unstable Benchmark Information

Tidal 10

VM#: 817
PID#: AT0687

Tidal 13

VM#: 821
PID#: AT0688

```
-----  
- This listing contains control for which complete digital -  
- data sheets were not provided. The complete data sheets were -  
- not provided for the reason listed below. The reason below is -  
- associated with a horizontal control Nonpub code shown under -  
- the heading 'H' and/or a vertical control Nonpub code shown under -  
- the heading 'v' -  
- -  
- The format of the records are as follows: -  
- Pid = Station Permanent Identifier) -  
- Name = Station Designation -  
- Lat = Approx. Latitude (Degrees, Minutes, truncated Seconds) -  
- Lon = Approx. Longitude (Degrees, Minutes, truncated Seconds) -  
- O = Horizontal Order -  
- o = Vertical Order -  
- H = Horizontal Nonpub Code -  
- v = Vertical Nonpub Code -  
- -  
- H Nonpub HORIZONTAL CONTROL NONPUB REASON -  
-----  
- X Surface Mark Reported Destroyed -  
- Y Surface and underground mark reported destroyed -  
- A A-Order Horizontal mark not tied to an adjusted HARN -  
- C C-Nonoperational CORS Station -  
- W Weakly determined position. -  
- P Purpose of position is not for network control -  
- D No Descriptive Text available -  
- R Restricted position -  
- O Outside NGS Publication Area -  
- N No geodetic control at this mark -  
- -  
- v Nonpub VERTICAL CONTROL NONPUB REASON -  
-----  
- X Surface Mark Reported Destroyed -  
- Y Surface and underground mark reported destroyed -  
- F Bench Mark not yet adjusted. -  
- D No Descriptive Text available -  
- Z Presumed destroyed -  
- R Restricted elevation -  
- O Outside NGS Publication Area -  
- N No geodetic control at this mark -  
- S Mark is in a subsidence area -  
-----
```

Example of Stable Benchmark Information

Grand Isle 8761724

The NGS Data Sheet

```
DATABASE = ,PROGRAM = datasheet, VERSION = 7.65
1 National Geodetic Survey, Retrieval Date = MARCH 23, 2009
AT0685 *****
AT0685 HT_MOD - This is a Louisiana Height Modernization Survey Station.
AT0685 TIDAL BM - This is a Tidal Bench Mark.
AT0685 DESIGNATION - 876 1724 TIDAL 11
AT0685 PID - AT0685
AT0685 STATE/COUNTY- LA/JEFFERSON
AT0685 USGS QUAD - BARATARIA PASS (1993)
AT0685
AT0685 *CURRENT SURVEY CONTROL
AT0685
AT0685 NAD 83 (2007)- 29 15 53.27904(N) 089 57 27.08170(W) ADJUSTED
AT0685 NAVD 88 - 0.91 (meters) 3.0 (feet) GPS OBS(2006.81)
AT0685 **This station is located in a suspected subsidence area (see below).
AT0685
AT0685 EPOCH DATE - 2002.00
AT0685 X - 4,128.334 (meters) COMP
AT0685 Y - -5,568,528.215 (meters) COMP
AT0685 Z - 3,099,526.935 (meters) COMP
AT0685 LAPLACE CORR- 0.73 (seconds) DEFLECN99
AT0685 ELLIP HEIGHT- -23.033 (meters) (03/12/08) ADJUSTED
AT0685 GEOID HEIGHT- -23.99 (meters) GEOID03
AT0685
AT0685 ----- Accuracy Estimates (at 95% Confidence Level in cm) -----
AT0685 Type PID Designation North East Ellip
AT0685
AT0685 NETWORK AT0685 876 1724 TIDAL 11 0.51 0.45 1.08
AT0685
AT0685 OBS GRAVITY - 979,292.1 (mgal) GRAV_OBS
AT0685
AT0685 ELLP ORDER - THIRD CLASS I
AT0685
AT0685 The horizontal coordinates were established by GPS observations
AT0685 and adjusted by the National Geodetic Survey in February 2007.
```

T I D A L B E N C H M A R K S

Tidal 11

BENCH MARK STAMPING: 11
DESIGNATION: 11

MONUMENTATION:

Survey disk
US Coast Guard (USCG)
Concrete bulkhead

VM#: 828
PID#: [AT0685](#)

k set flush in top of a concrete bulkhead next to the
m (153.0 ft) west of the entrance doors to the Coast
ilding, 18.50 m (60.7 ft) south of the NE corner of the
7.38 m (24.2 ft) north of the NE pile of the NOAA tide

Orthometric Elevation Derived by GPS (2007)



Calculating LMSL – NAVD88 @ Grand Isle

T I D A L D A T U M S

Tidal datums at GRAND ISLE, EAST POINT based on:

LENGTH OF SERIES: 5 YEARS
 TIME PERIOD: January 2002 - December 2006
 TIDAL EPOCH: 1983-2001
 CONTROL TIDE STATION:

**LMSL is 55 mm above
NAVD88 (2006.81)**

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in METERS:

HIGHEST OBSERVED WATER LEVEL (08/29/2005) = 1.705
 MEAN HIGHER HIGH WATER (MHHW) = 0.322
 MEAN HIGH WATER (MHW) = 0.320
 MEAN SEA LEVEL (MSL) = 0.163
 MEAN TIDE LEVEL (MTL) = 0.161
 MEAN LOW WATER (MLW) = 0.003
 MEAN LOWER LOW WATER (MLLW) = 0.000
 LOWEST OBSERVED WATER LEVEL (12/24/1989) = -0.671

**NAVD88
Unpublished**

**LMSL = 0.163 m
NAVD88 = 0.108 m
0.163 – 0.108 =
0.055 m**

National Geodetic Vertical Datum (NGVD 29)

Bench Mark Elevation Information In METERS above:

Tidal 11

Stamping or Designation	MLLW	MHW
10	0.993	0.673
13 1975	1.018	0.688
11	1.018	0.688
1724 F 1892	1.137	0.787
1724 G 1892	1.185	0.865

13 1975
11

1.018 - 0.91 m = 0.108 m



So Why Isn't NAVD88 Published @ Grand Isle?

T I D A L D A T U M S

Tidal datums at GRAND ISLE, EAST POINT based on:

LENGTH OF SERIES: 5 YEARS
TIME PERIOD: January 2002 - December 2006
TIDAL EPOCH: 1983-2001
CONTROL TIDE STATION:

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in METERS:

HIGHEST OBSERVED WATER LEVEL (08/29/2005) = 1.705
MEAN HIGHER HIGH WATER (MHHW) = 0.322
MEAN HIGH WATER (MHW) = 0.320
MEAN SEA LEVEL (MSL) = 0.163
MEAN TIDE LEVEL (MTL) = 0.161
MEAN LOW WATER (MLW) = 0.003
MEAN LOWER LOW WATER (MLLW) = 0.000
LOWEST OBSERVED WATER LEVEL (12/24/1989) = -0.671

**NAVD88
Unpublished**

National Geodetic Vertical Datum (NGVD 29)

Bench Mark Elevation Information In METERS above:

Stamping or Designation	MLLW	MHW
10	0.993	0.673
13 1975	1.018	0.698
11	1.018	0.698
1724 F 1992	1.137	0.817
1724 G 1992	1.185	0.865

**NOS Standard
requires a
minimum of two
benchmarks to
publish
NAVD88**

**LMSL is 55 mm above
NAVD88 (2006.81)**



Calculating LMSL – NAVD88 @ Dauphin Island

Bench Mark Sheets

Click [HERE](#) for printable version

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Ocean Service

[Datums Page](#)

Page 1 of 7

Station ID: 8735180 PUBLICATION DATE: 04/21/2003
Name: DAUPHIN ISLAND, MOBILE BAY
ALABAMA
NOAA Chart: 11376 Latitude: 30° 15.0' N
USGS Quad: LITTLE DAUPHIN ISLAND Longitude: 88° 4.5' W

PRIMARY BENCH MARK STAMPING: NO 1 1960
DESIGNATION: 873 5180 TIDAL 1

MONUMENTATION: Tidal Station disk
AGENCY: US Coast and Geodetic Survey (USC&GS)
SETTING CLASSIFICATION: Gun mount on wall

VM#: 787
[PID#: BH1756](#)

The primary bench mark is a disk set in the top of the NE corner of a gun mount located outside the Main Fort wall near the NW corner, 15.24 m (50.0 ft) east of a radio tower.

BENCH MARK STAMPING: NO 2 1960
DESIGNATION: 873 5180 TIDAL 2

MONUMENTATION: Tidal Station disk
AGENCY: US Coast and Geodetic Survey (USC&GS)
SETTING CLASSIFICATION: Gun mount

VM#: 788
[PID#: BH1757](#)

The bench mark is a disk set in a concrete gun mount on top of the main wall, 7.62 m (25.0 ft) SE of the extreme NW corner of the fort, and 3.66 m (12.0 ft) NE of an iron cannon.

**8 Benchmarks
@ Dauphin Is.
can be obtained
from NGS
datasheets**



Calculating LMSL – NAVD88 @ Dauphin Island

Tidal datums at DAUPHIN ISLAND, MOBILE BAY based on:

LENGTH OF SERIES: 15 Years
 TIME PERIOD: January 1983 - December 1997
 TIDAL EPOCH: 1983-2001
 CONTROL TIDE STATION: 8729840 PENSACOLA, PENSACOLA BAY

**Avg. NAVD88 Value
 = 0.0694 m**

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in METERS:

HIGHEST OBSERVED WATER LEVEL (09/02/1985) = 1.391
 MEAN HIGHER HIGH WATER (MHHW) = 0.367
 MEAN HIGH WATER (MHW) = 0.361
 MEAN TIDE LEVEL (MTL) = 0.182
 MEAN SEA LEVEL (MSL) = 0.172
 NORTH AMERICAN VERTICAL DATUM-1988 (NAVD) —————
 MEAN LOW WATER (MLW) = 0.000
 MEAN LOWER LOW WATER (MLLW) = 0.000
 LOWEST OBSERVED WATER LEVEL (01/19/1977) = -0.633

Unknown?

**LMSL /
 NAVD88 =
 0.1026 m**

National Geodetic Vertical Datum (NGVD 29)

Bench Mark Elevation Information

In METERS above:

Stamping or Designation

MLLW MHW

5.341 m = 0.070 m
6.824 m = 0.071 m
6.326 m = 0.071 m
6.481 m = 0.067 m
6.787 m = 0.071 m
2.606 m = 0.067 m
2.598 m = 0.069 m
2.543 m = 0.069 m

NO 1 1960
NO 2 1960
NO 3 1960
NO 4 1966
5180 A 1976
5180 B 1976
5180 C 1976
5180 E 1976

21D - 2E	5.411	5.050
21D - 2C	5.277	4.916



Calculating LMSL – NAVD88 @ New Canal Station (8761927)

T I D A L D A T U M S

Tidal datums at USCG NEW CANAL STA., LAKE PONTCHARTRAIN based on:

LENGTH OF SERIES: 3 YEARS
TIME PERIOD: January 2006 - December 2008
TIDAL EPOCH: 1983-2001
CONTROL TIDE STATION: 8747437 BAY WAVELAND YACHT CLUB, BAY ST. LOUIS

Elevations of tidal datums referred to Mean Lower Low Water (MLLW), in METERS:

HIGHEST OBSERVED WATER LEVEL (09/13/2008) = 1.670
MEAN HIGHER HIGH WATER (MHHW) = 0.151
MEAN HIGH WATER (MHW) = 0.151
MEAN TIDE LEVEL (MTL) = 0.075
MEAN SEA LEVEL (MSL) = 0.075
MEAN LOW WATER (MLW) = 0.000
MEAN LOWER LOW WATER (MLLW) = 0.000
LOWEST OBSERVED WATER LEVEL (12/25/1989) = -0.782

LMSL Above NAVD88 = 0.066 m

National Geodetic Vertical Datum (NGVD 29)

Bench Mark Elevation Information In METERS above:

Stamping or Designation	MLLW	MHW
ALCO 1931	1.849	1.698
1927 A 1982	1.596	1.445
ALCO 1931 RM	1.759	1.608
V 148 1951	1.997	1.846
1927 B 1982	1.668	1.517
X 374 1985	1.554	1.403
1927 D 2005	1.868	1.717
1927 E 2005	1.887	1.736
1927 F 2006	1.827	1.676
1927 G 2006	1.909	1.758
1927 H 2006	1.423	1.272

1.849 - 1.840 m = 0.009 m



Relationship between LMSL and NAVD88, 2004.65, & 2006.81

Changing Tidal & Geodetic Elevations

STA_ID	8761402	8761927	8762084	8761724	Orthometric Datum		
STA_NAME	THE RIGOLETS	USCG NEW CANAL	LEEVILLE	GRAND ISLE			
PID	BH1164	BJ1342	AU1255	AT0685			
DESIG	PIKE RESET	ALCO	JESSE	876 1724 TIDAL 11			
2006.81 m	2.468	1.839	0.316	0.905			
2004.65	2.480	1.870	0.370	0.950			
NAVD88	2.630	2.008	0.573	1.215			
BM Above MLLW m	2.560	1.871	0.456	1.018			
MSL	0.125	0.076	0.143	0.163			
2006.81 m	0.092	0.032	0.140	0.113			2006.81
2004.65	0.080	0.001	0.086	0.068			2004.65
MLLW	0.000	0.000	0.000	0.000			
NAVD88	-0.070	-0.137	-0.117	-0.197	NAVD88		

Relationship between LMSL and NAVD88

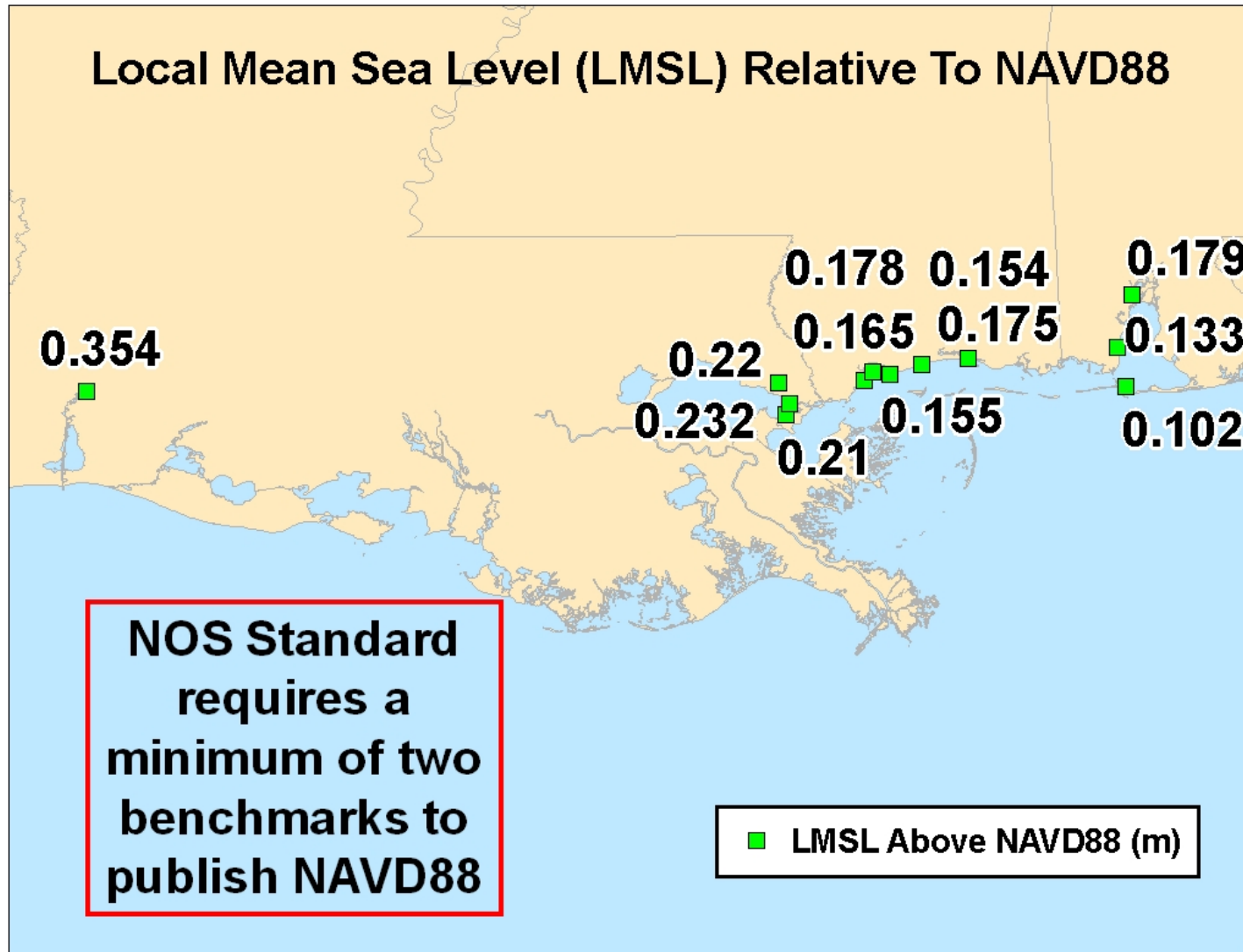
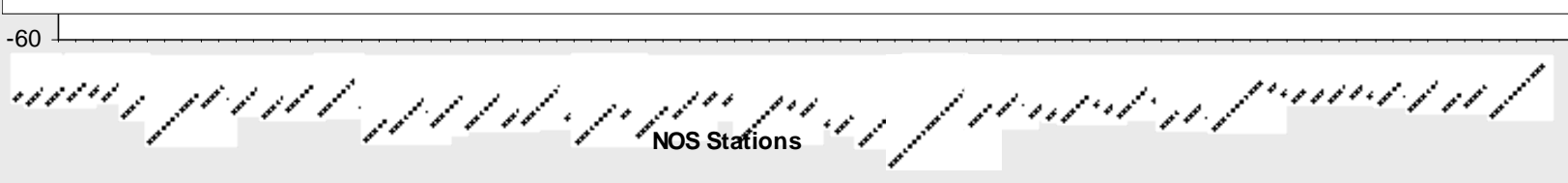
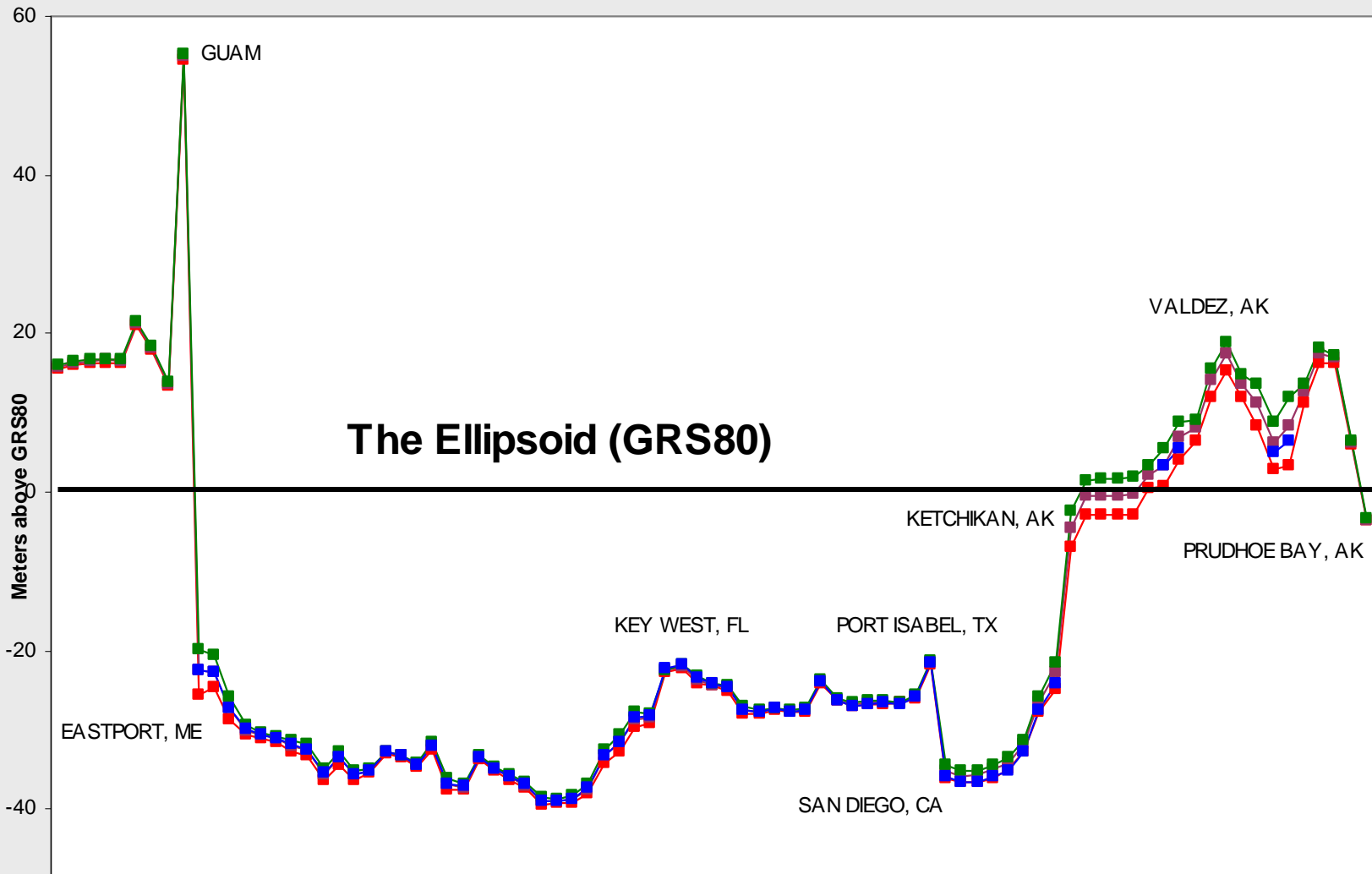




Figure 3. Elevation difference between LMSL (1983-1999 NTDE) and NAVD 88. [Note: The LMSL for Grand Isle, Louisiana is based on the 2001-2006 Modified Tidal Datum Epoch and an updated NAVD 88 epoch 2006.81 specific to the Louisiana region.]

Tidal - Ellipsoidal - Orthometric Relationships



Tidal and Geodetic Datums

Tidal and Geodetic Relationships

Tidal Datums Team
nos.coops.datums@noaa.gov

