

National Ocean Service Center for Operational Oceanographic Products and Services

## USER GUIDE Understanding NOAA Tide Predictions

### **Tide Predictions**

NOAA Tide Predictions allows you to generate past, present, and future tide predictions at 3000+ locations along the U.S. coastline.

Tide predictions provide the times and heights for the astronomical tides. Driven by the motion of the Earth, Moon, and Sun, predictions are based on the analysis of data collected at coastal locations.

NOAA Tide Predictions *do not include* other influences that can alter coastal water level heights, like storm surge or sea level rise.





# Two Types of Stations

CO-OPS displays tide predictions for *harmonic* and *subordinate* stations.

#### **Harmonic Stations**



Harmonic stations are labeled with purple pins on the map interface. They are locations with enough long-term tide data to establish *harmonic constants* and *tidal datums*. Predictions for these stations are based solely on the analysis of that data. Because predictions at these locations are based on harmonic constants, predictions can be generated for any interval, and can be adjusted to different tidal datums. CO-OPS has preselected the most common intervals (hourly, 15- and 6-minute) for data queries.

### **Subordinate Stations**

Subordinate stations are short-term historic stations. They are labeled with white pins on the map interface (see *image to left*), and on the Tide Predictions interface page they are labeled "Subordinate Station" with their harmonic reference station also named.

Since subordinate stations collect data for shorter time periods, harmonic constants cannot be calculated at these locations. Because these stations do not have their own harmonic constants, they rely on nearby harmonic stations to generate predictions.

To do this, high and low tide predictions for the harmonic reference station are generated, and adjustments based on the location of the subordinate station relative to the harmonic station are applied to these predictions.

Since this process generates predictions for high and low tides only, any interval between these tides is an approximation. Accessing NOAA Tide Predictions

for a location

On our website, <u>www.tidesandcurrents.noaa.gov</u>, there are two ways to access this information.



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### **Through the Map Interface**



From the <u>Tides and Currents homepage</u>, you can locate a station by: 1. clicking on a state on the map to bring up all the pins for that state, or 2. entering a city, state, or zip code to get results within a general area. Stations that are currently in operation are also searchable by their station ID.

FIND YOUR LOCAL TIDES AND	CURRENTS ×
Search:	
Station ID/City/State/Zip	
Region:	
Choose	\$
Data Type:	
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Real Time Data Historic Data Datums Currents	
Tide Predictions	
Current Predictions Meteorological Conductivity Forecast Guidance Bench Mark Sheets	n
Sea Level Trends	

To ensure that you are accessing only stations that generate NOAA Tide Predictions, from the map interface you will need to select:

- "Advanced" within the top left search box
- Then, in the Data Type dropdown, select *"Tide Predictions"*

You can now choose from purple pins (harmonic stations) or white pins (subordinate stations) that populate the map to get information on that station.

Refer to the section *"Types of Stations" (on page 2 of this document)* for more information on harmonic and subordinate stations.

### Through the Map Interface Continued...

There are two ways to get NOAA Tide Predictions for a station once you are looking at the station's pop-up window, called the **station dashboard**.

Map Option 1: From this station dashboard, click on the *"More Data"* button to reveal a dropdown. Select *"Tide Predictions"* from the list.

This selection will take you directly to the Tide Predictions page (see below image) for that specific station.



Image: Station Dashboard for Boston, MA



Image: Tide Predictions page for Boston, MA

### Through the Map Interface Continued...

Map Option 2: Alternatively, from a station dashboard you can also click on the *"Station Home"* button to be taken directly to that station's homepage.

Once on the station homepage (see below image), open the top left dropdown entitled "Tides/Water Levels."

From the dropdown list, select *"NOAA Tide Predictions."* 





Image: Station Dashboard for Boston, MA

This will open the Tide Predictions page for that station.

Home / Products / 8443970 Boston, I Station Info - Tides:Water Levels -	MA ☆ Favorite Stations →	DFS			
Boston, / Harmonic Constituents	LD: 8443970				
Station Info Datums	Sensor Information Observations Dir	rections and Map Available Proc	lucts		
Established: NOAA Tide Predictions Sea Level Trends	May 03, 1921 0° E	Today's Tides (LST)		_	
Present Installatio Reports	Nov 16, 1988		5:05 PM		
Date Removed:	N/A		tow hij		
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Image: Station homepage for Boston, MA

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### **Through the Station Listing**

You can also access a list of stations with tide-predicting capabilities from anywhere on the CO-OPS website by hovering your cursor over or selecting the *"Data & Product Products"* dropdown, then selecting *"Tides and Water Levels,"* and on the subsequent webpage selecting *"NOAA Tide Predictions."* 



From here, click on a state or territory to see all the stations available in that region.

ose a station us	ing our Tides and (	NOAA	Tide Predictions	station name, ID, or latitude/long		
	<b>?</b>	Or search:		Go search help		
West Coast	East Coast	Gulf Coast	Pacific	Caribbean Islands		
California	Maine	Alabama	Northern Marianas Islands	Bermuda Islands		
Oregon	New Hampshire	Mississippi	Federated States of Micronesia	Bahamas		
Washington	Massachusetts	Louisiana	Marshall Islands	Cuba		
Alaska	Rhode Island	Texas	Hawaii	Jamaica		
	Connecticut		Kiribati	Haiti and Dominican Republic		
	New York		Tokelau	Puerto Rico		
	New Jersey		American Samoa	Lesser Antilles & Virgin Islands		
	Delaware		French Polynesia			
	Pennsylvania		Cook Islands			
	Maryland		Fiji			
	Virginia					
	Washington DC					

On the East and Gulf Coasts, stations are listed geographically from north to south, while on the West Coast they are listed south to north.

Selecting a station from one of these lists will take you directly to that station's Tide Predictions page.

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### Navigating Our Tide Predictions Interface

You have now reached our Tide Predictions interface. Once here you will see a plot displaying predictions for the present day and the next day in local standard time with adjustments for daylight saving time (LST/LDT) and with heights in feet relative to mean lower low water (MLLW). These parameters can all be customized; however, the maximum amount of data that can be plotted at once is 31 days.

#### **Displaying Data**

There are several ways to display data within selected parameters.

The blue buttons under the graph allow you to display data in one of the following three ways.



- 1. "Plot Daily" provides one plot showing the high and low tides for each day that you selected in the output parameters, up to 31 days. When using the "Plot Daily" function, you can also use the icon with three stacked lines on the upper right side of the plot to download an image of the plot in the format of your choice. This allows you to easily insert images of a particular tide plot into documents as needed.
- 2. "Plot Calendar" provides a calendar view of high and low tides for the dates you have selected. The output will only provide one calendar month at a time, and it will select the month pertaining to the start date you've selected. For example, selecting dates from June 10th July 10th and selecting "Plot Calendar" will output the calendar month of June.
- 3. "Data Only" will provide the data you request in a table.

Each output option has its own printer view. Once you have plotted the data you need, select *"Printer View"* from the upper right hand side of the page. In the preview, the layout for monthly predictions may appear distorted; however, this will print normally.

Navigating Our Tide Predictions Interface *Continued...* 



### **Threshold Function**

An additional function of the interface is to be able to highlight predicted tides above or below a user-identified threshold. The *"Threshold Direction"* option allows you to select whether you would like to highlight water levels greater than or less than a certain value.



Selecting a threshold direction, entering a value into the *"Threshold Value"* box, and clicking *"Plot Daily," "Plot Calendar,"* or *"Data Only"* will highlight predictions that fall above or below the set parameters in red. This function is useful for highlighting high or low tides that may impact navigation or that indicate inundation.

**Other parameters within the interface are also customizable.** For example, time zone units, reference datum (harmonic stations only), time display, and data interval displayed (harmonic stations only) can all be edited as desired.

### Annual Tide Predictions

Download & Print



#### In 2020, CO-OPS stopped producing physical annual tide tables, but our web interface allows users to generate and print this product for any tide-predicting station.



Image: NOAA Tide Predictions download option

To download an annual Tide Predictions sheet, click the blue *"Click Here for Annual Published Tide Tables"* button at the top right corner of a station's prediction page.

Set parameters as desired, including output format. Click *"Download"* to get tide tables for the selected station and year.

There are also various data download options in the middle of the station predictions page, located just above the Data Listing on the right.

The three buttons allow you to download your output as an XML or TXT file, or in JSON or CSV format when you select *"Web Services."* 

All data on our website, including tide prediction output, is served via the <u>CO-OPS Data API</u>. For more information on using CO-OPS APIs to retrieve tide predictions and other data, please visit our <u>Web Services page</u>.

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Image: NOAA Tide Tables

### **Update Schedule**

**NOAA Tide Prediction updates are applied every quarter:** during the first two weeks of January, April, July, and October. These updates may include:

- The addition of new stations
- Upgrade of a station from subordinate to harmonic
- Changes to the adjustment values and reference station for subordinate stations
- The removal of superseded stations that may have been replaced by another station for improved prediction accuracy

### Scan this QR Code

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to visit our website.



For additional questions about NOAA Tide Predictions, or to suggest an update to this guide, please email **tide.predictions@noaa.gov**.

### Glossary

Find these and more terms in our online glossary.

**Datum:** A base elevation used as a reference from which to reckon heights or depths

Harmonic Analysis: The mathematical process by which the observed tide or tidal current at any place is separated into basic harmonic constituents

Harmonic Constants: The amplitudes and epochs of the harmonic constituents of the tide or tidal current at any place

Harmonic Constituent: One of the harmonic elements in a mathematical expression for the tide-producing force and in corresponding formulas for the tide or tidal current. Each constituent represents a periodic change or variation in the relative positions of the Earth, Moon, and Sun

**Reference Station:** A tide or current station for which independent daily predictions are given in the "Tide Tables" and "Tidal Current Tables," and from which corresponding predictions are obtained for subordinate stations by means of differences and ratios

**Subordinate Tide Station:** A tide station from which a relatively short series of observations is reduced by comparison with simultaneous observations from a tide station with a relatively long series of observations

**Tide:** The periodic rise and fall of a body of water resulting from gravitational interactions between Sun, Moon, and Earth. The vertical component of the particulate motion of a tidal wave

Tidal Datum: A datum that is defined in terms of a certain phase of the tide

**Tide (Water Level) Station:** The geographic location at which tidal observations are conducted. Also, the facilities used to make tidal observations. These may include a tide house, tide (water level) gauge, tide staff, and tidal bench marks