

Calculate Mean Highest Predicted Tide

JULY 2021



This document provides instructions on how to extract, sort, and calculate average highest predicted tide (HPT) over a ten-year period using Excel and data from the [NOAA Tides & Currents](#) page. HPT can be used to establish high tide line for US Army Corps of Engineers limit of jurisdiction for tidal waters for Section 404 permitting.

Follow these steps to calculate the ten year mean HPT

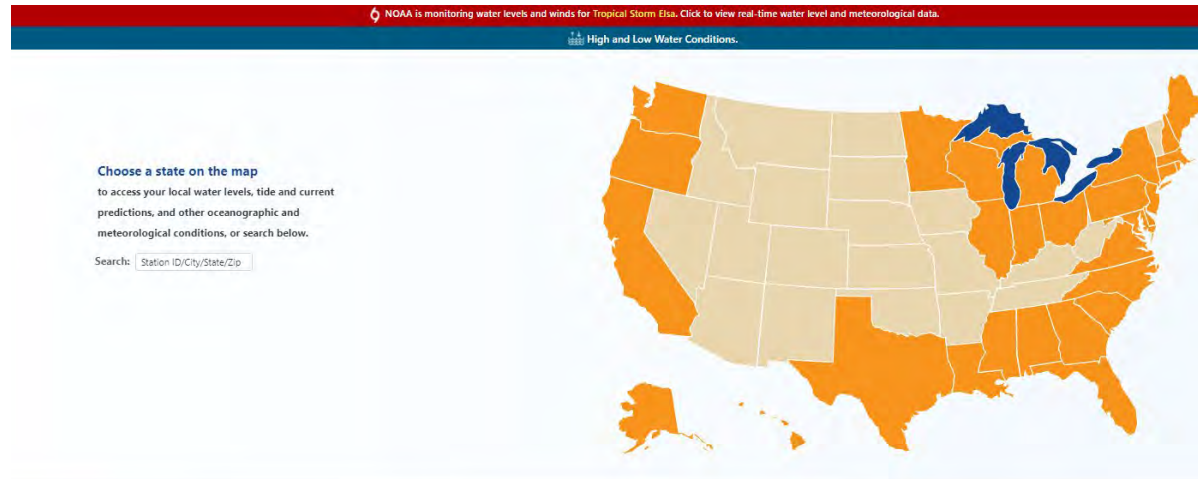
First determine the appropriate tide station to use in relation to your project area (usually harmonic stations include the data you need while subordinate stations lack necessary data). Note the nearest tide station may not be the most applicable to your project location.







Step 1

Go to the [NOAA Tides & Currents](#) page.

Step 2

Select Tide Predictions



-  **PORTS®**
An integrated system of sensors concentrated in seaports across the U.S. that provide accurate and reliable real-time information about environmental conditions.
-  **Coastal Inundation Dashboard**
Provides real-time and historical coastal flood information at select locations.
-  **Tide Predictions**
Official U.S. high and low tide predictions.
-  **High Tide Bulletin**
Shows each region of the U.S. when, where and why their region may experience higher than normal high tides.
-  **Harmful Algal Bloom Forecasts**
Regular forecasts for the Gulf of Mexico and Lake Erie.
-  **Coastal Condition Forecasts**
Nowcast and forecast (out to 48-72 hours) model information on water levels, currents, wind, salinity, and water temperature.

Step 3

Select your state from a list of stations.

NOAA TIDES & CURRENTS

Home About What We Do News Education Search

NOAA is monitoring water levels and winds for Tropical Storm Elsa. Click to view real-time water level and meteorological data.

Home / Products / Tide Predictions

NOAA Tide Predictions

About NOAA Tide Predictions

Choose a station using our Tides and Currents Map, click on a state below, or search by station name, ID, or latitude/longitude.

Or search: 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		French Polynesia	Haiti and Dominican Republic
	New York		Cook Islands	Puerto Rico
	New Jersey		Fiji	Lesser Antilles & Virgin Islands
	Delaware		Tokelau	
	Pennsylvania		American Samoa	
	Maryland		Kiribati	
	Virginia			
	Washington DC			
	North Carolina			
	South Carolina			
	Georgia			
	Florida			

History of Changes/Updates to NOAA Tide Predictions

[Click here for 2012-present Tidal Prediction Updates](#)

Step 4

Choose your station from a list (blue circle) or a map (red circle). If you select the map option, the map screen shown on the right appears. The Harmonic stations provide a more robust data set and are indicated by purple pins. Subordinate stations often lack the complete data set you need to perform your analysis and are shown in white.

The screenshot shows the NOAA Tides & Currents website. On the left is a list of states. The main area is titled 'NOAA Tide Predictions' and shows a search bar with a red circle around the map icon. Below the search bar is a table of stations for Washington. The 'Columbia River' station is circled in blue. To the right is a map of the Pacific Northwest with various station locations marked by purple (harmonic) and white (subordinate) pins.

Name	ID	Lat	Lon	Predictions
Columbia River				
Columbia River Entrance (H. Jetty)	0440574	+46.2723	-124.0720	Subordinate
Cape Disappointment	0440511	+46.2810	-124.0403	Harmonic
Fort Canby Jetty 'K' Wash.	0440572	+46.2863	-124.0370	Subordinate
Heads, Baker Bay, Wash.	0440507	+46.3033	-124.0400	Subordinate
Chinook, Baker Bay, Wash.	0440573	+46.2717	-123.9480	Subordinate
Hungry Harbor, Wash.	0440503	+46.2563	-123.9480	Subordinate
Hammond, Oregon	0430011	+46.2017	-123.6450	Harmonic
Fort Adams, Oreg.	TW00811	+46.2000	-123.6500	Subordinate
Astoria (Woodcock Neck), Oreg.	0430025	+46.1717	-123.6420	Subordinate
Clifton Landing, Youngs Bay, Oreg.	0430772	+46.1243	-123.8043	Harmonic
Wamerton, Longport River, Oreg.	TW00903	+46.1007	-123.9107	Subordinate
Astoria (Fort Stevens), Oreg.	0430023	+46.1807	-123.8600	Subordinate
ASTORIA (Tongue Point), Oreg.	0430040	+46.2073	-123.7093	Harmonic
Knappa, Knappa Slough	0430060	+46.1807	-123.8830	Subordinate
Sellers Point, Oreg.	0430054	+46.1750	-123.8780	Subordinate
Harrington Point, Wash.	TW00895	+46.2007	-123.6500	Subordinate
Skamokawa	0440000	+46.2007	-123.4320	Harmonic
Youngs	0430000	+46.1017	-123.4000	Harmonic

Step 5

Go to the Station Home. List option shown on left (blue circle– Station Info/Station Home Page). Map option shown on right (red circle – Station Home).

The screenshot shows the NOAA Tides & Currents website for station 0446807 BUDD INLET, SOUTH OF GULL HARBOR, WA. On the left, a blue circle highlights the 'Station Home' link in the top navigation bar. The main area displays a tide prediction graph for BUDD INLET, SOUTH OF GULL HARBOR, WA. On the right, a red circle highlights the 'Station Home' button in the top right corner. Below the graph, there is a table of today's tides and a 'Recent Data' section.

Time	Tide	Height
2:50 AM	high	12.05 ft
11:00 AM	low	-0.94 ft
6:03 PM	high	12.49 ft
11:36 PM	low	8.37 ft

Recent Data: Next Tide at 6:03 PM: high 12.49 ft above MLLW

Step 6

Copy your tide station ID number.

You can also select Datums at the bottom of the page to learn more about other useful tidal datums like MLLW, MLW, MHW, MHHW, HAT etc. You will also need to access the Datums page to convert MLLW (0 elevation relative to each individual tidal station) to NAVD88 (relative to topographic elevations used by survey).

The screenshot shows the NOAA Tides & Currents website for station BUDD INLET, SOUTH OF GULL HARBOR, WA. The station ID 9446807 is circled in red. The page includes a navigation bar, a breadcrumb trail, and a main content area with several sections:

- Station Info:** Established: Mar 01, 1996; Time Meridian: 120° W; Present Installation: Apr 19, 1996; Date Removed: 1998-12-05 23:59:00.0; Water Level Max (ref MHHW): N/A; Water Level Min (ref MLLW): N/A; Mean Range: 10.47 ft.; Diurnal Range: 14.6 ft.; Latitude: 47° 5.9 N; Longitude: 122° 53.7 W; NOAA Chart#: 18458; Met Site Elevation: N/A.
- Today's Tides (LST/LDT):** A table showing tide times and heights for the current day. The next high tide is at 6:25 PM with a height of 14.6 ft.
- How to reach:** A detailed description of the location and how to reach the tidal bench marks from the State Capitol building in Olympia.
- Map:** A map showing the location of the station in Olympia, WA.
- Products available at 9446807 BUDD INLET, SOUTH OF GULL HARBOR, WA:** A list of products available for this station, including Water Levels, NOAA Tide Predictions, Harmonic Constituents, Sea Level Trends, and **Datums** (highlighted in red).

The URL for the Datums page is: <https://tidesandcurrents.noaa.gov/datums.html?id=9446807>

Once you have determined the appropriate tidal station go to the High/Low Tide Predictions page to gather 10 years' worth of data and calculate the average HPT across the ten years to determine HPT.

Step 7

Go to NOAA's Center for Operational Oceanographic Products and Services (CO-OPS)

High/Low Tide Predictions site accessed here:

<https://opendap.co-ops.nos.noaa.gov/axis/webservices/highlowtidepred/>

Step 8

Paste the tidal Station ID number that you copied in Step 6 into the top box.

Enter the Begin Date of January 1 (YYYY0101) of the year you did field work for the project.

This will be the first date of your ten year HPT analysis.

Enter the End Date of December 31 (YYYY1231) of the year you did field work.

Leave the rest of the selections as the default: Datum MLLW, Data Units Feet, Time Zone LST*, and Display Format as HTML.

Then select Submit

Note: you will perform this data evaluations ten times, once for each year, so that you can determine the HPT for each of the individual ten years, before you average them to get the final HPT for the entire ten year period.

High/Low Tide Predictions

Enter a station ID, begin date and end date to get the high low tide predictions data for that specific station, or you can use the default supplied values. The Date format could be either: YYYYMMDD or YYYYMMDD HH:MM. Datum and data units are parameters for output formatting. Display format is an output selection.

* Choosing LST (Local Standard Time) option as time zone will return resultant data in Local Standard Time of the station.

Station ID	<input type="text" value="9446807"/>
Begin Date	<input type="text" value="20210101"/>
End Date	<input type="text" value="20211231"/>
Datum	<input type="text" value="MLLW"/>
Data Units	<input checked="" type="radio"/> Feet <input type="radio"/> Meters
Time Zone	<input checked="" type="radio"/> LST* <input type="radio"/> UTC
Display Format	<input type="radio"/> XML <input checked="" type="radio"/> HTML <input type="radio"/> TEXT
	<input type="button" value="Submit"/>

Web site owner: Center for Operational Oceanographic Products and Services (CO-OPS) [Privacy Policy](#) [Take Our Survey](#)

Step 9

Highlight all the data in the Date/Time/Pred/Type columns by dragging your cursor all the way to the bottom while holding your left mouse selection button down. You will have selected an entire year's worth of data. Copy the highlighted cells (right click+Copy or Cntrl+C).

High Low Tide Predictions Data

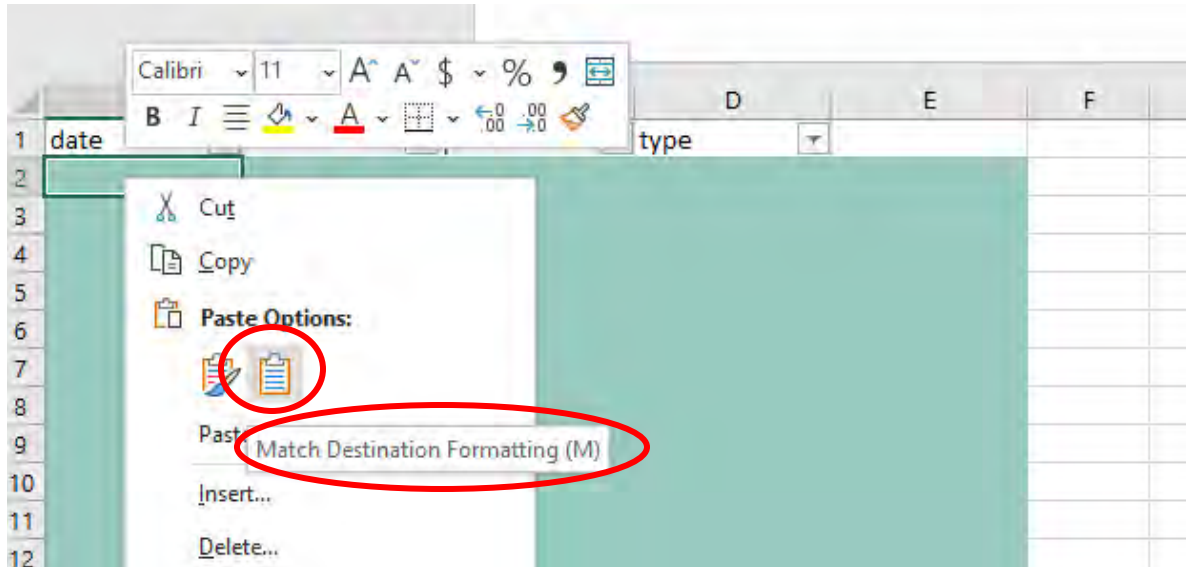
Date Date of the data
Time Time of the day (24h)
Pred The predicted height value
Type H: High L: Low

Station ID:	9446807		
Station Name:	BUDD INLET, SOUTH OF GULL HARBOR		
Latitude:	47.0983	degrees North	
Longitude:	-122.895	degrees West	
State:	WA		
Data Source:	USDOC/NOAA/NOS/COOPS(Center for Operational Oceanographic Products and Services)		
Data Disclaimer:	The official Tide and Tidal Current prediction tables are published annually on October 1, for the following calendar year. Tide and Tidal Current predictions generated prior to the publishing date of the official tables are subject to change. The enclosed data are based upon the latest information available as of the date of your request. Tide and Tidal Current predictions generated may differ from the official predictions if information for the station requested has been updated since the publishing date of the official tables.		
Begin Date:	20210101		
End Date:	20211231		
Datum:	MLLW		
Unit:	Feet		
Time Zone:	LST		

Date	Time	Pred	Type
01/01/2021	00:46	-1.747	L
01/01/2021	07:50	15.317	H
01/01/2021	13:36	8.059	L
01/01/2021	18:05	13.175	H
01/02/2021	01:24	-1.48	L

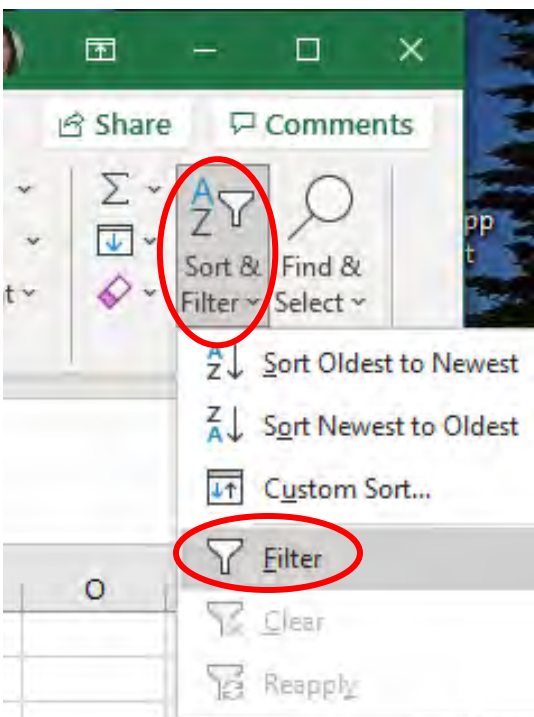
Step 10

Use the WSDOT Excel HTL calculator or open a blank Excel workbook. Right click the first cell under the date column in the WSDOT calculator, or the first cell in a blank workbook, and click Match Destination Formatting under Paste Options. If using a blank new Excel workbook drag column A over to make it a bit wider so the entire date will appear.



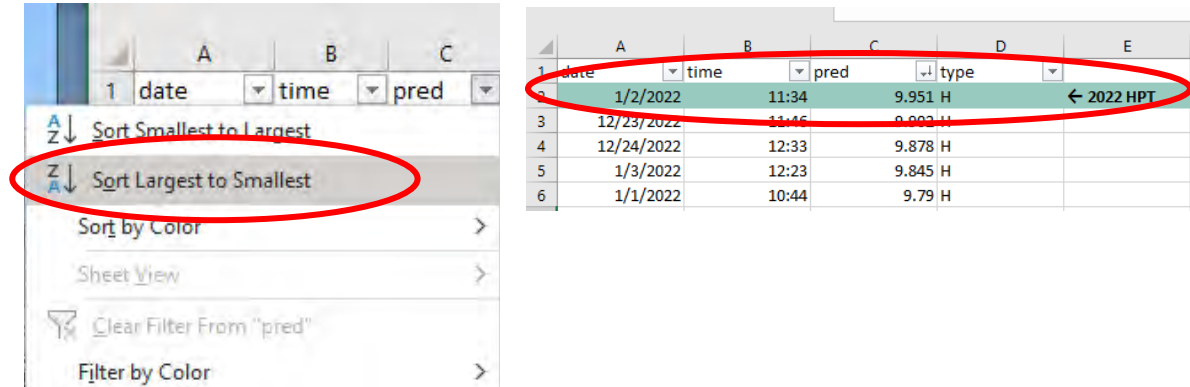
Step 11 (blank Excel only – if using the WSDOT HTL calculator skip to Step 12)

In a blank Excel highlight the four columns with imported data, columns A through D. Then from the Home Tab on the Ribbon, select Sort & Filter, then filter. Selecting the Filter option establishes dropdown arrows at the top of each column.



Step 12

Select the drop down in Column C, the pred column (pred = tidal elevation prediction), and select Sort Largest to Smallest. This sorts all of the columns based on tide predictions and places the HPT for the year in the top row of data.



Step 13

Return to the High/Low Tide Predictions site in Step 8, and enter in the next years date range <https://opendap.co-ops.nos.noaa.gov/axis/webservices/highlowtidepred/>

You can easily navigate backward by using the back button on your internet browser. If you access it using this method all the information you previously entered will be retained and all that needs to be changed is the years in the Begin Date and End Date field. For example, if your field work occurred in 2021 the first year Begin Date is 20210101 and the End Date is 20211231. The second time you return to the High/Low Tide Predictions screen you enter the dates of 20220101 and 20221231.

Once you've entered the new dates repeat steps 9 through Step 12 on a new workbook tab on the bottom of Excel until you have completed the data analysis for ten years.

Step 14

If you used the WSDOT Excel HTL calculator return to the first workbook tab and review your average HPT results for the ten-year period. If you used a blank Excel create a last, 11th workbook tab to summarize your data and use Excel to calculate the average of your HPTs from each of the 10 years.

Record the Highest Astronomical Tide (HAT) on the data summary worksheet. Compare the HPT method you just completed in Step 1 through Step 14 to the HAT and determine which you will apply to your project as the HTL.

HAT is accessed from the Datum option as shown in Step 6.

Note: tidal station data is based off of an elevation of 0 MLLW. The MLLW elevation is unique to each individual tidal station. Convert the MLLW elevation to NAVD88 topographic elevation and apply the NAVD88 elevations of HTL to plan sheets. Note on plan sheets that the datum used is NAVD88.

Complete the elevation conversion from the Datums link described in Step 6. After navigating to the Datums link, under the graphic, click the Datums drop down and change it from MLLW to NAVD88. Then look at the graphic to see how to offset the MLLW elevation to achieve the NAVD88 elevation for HTL. This information is also entered into the WSDOT HTL calculator.