# NOAA Tidal Analysis Datums Calculator Users Guide

The Tidal Analysis Datums Calculator (TAD) allows users to load in a file of water level data to quickly generate a simple suite of tidal datums. This tool is built on a foundation of simplified algorithms that already exist in various National Ocean Service (NOS) products but there is no requirements for users to enter information such as benchmark diagrams, sensor specifications and station metadata. The tool will help public and private users to analyze and understand water level data in their areas of interest by calculating preliminary datums from user data.

**Use the tool to compute datums:**

**Step #1: Browse your data file**

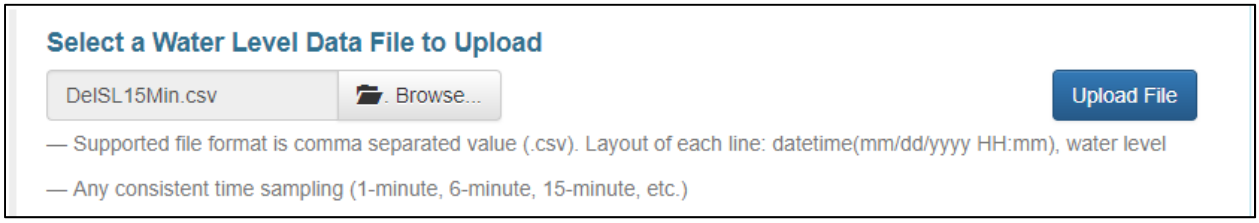


Figure 1. Browse and upload your file

Select the water level data file by clicking "**Browse"** button and then navigate to the file on your PC (Figure 1). The tool supports .csv data format. Once you select a file, click "**Upload File**". The file should only contain two columns, time stamp and water level data (Figure 2). Delete any extra columns. Below are the requirements for input files:

- Date format: .csv file in the format of timestamp, water level (mm/dd/yyyy HH:MM, xxx.xxx or mm-dd-yyyy HH:MM, xxx.xxx)
- Header: a single line of header or no headers
- Time sampling: any consistent time intervals
- Gaps: no more than 3 hours. The datum calculator will fill in all gaps less than 3 hours. For any gaps more than 3 hours, the datum calculator treat them as separated time segments and only compute tidal datums for the longest continuous time segment.
- Data length: maximum file size of 50 MB. There is no limitation for the minimum data length. However, it is strongly recommended that your date length is at least 2 weeks long because that is about the period of the major harmonic constituent M2. Otherwise, the error associated with the computed datums will be so high and there is no meaning to compute datums.

```
Date-Time,Value
1/1/2016 0:00,0.12
1/1/2016 0:15,0.17
1/1/2016 0:30,0.23
1/1/2016 0:45,0.29
1/1/2016 1:00,0.34
1/1/2016 1:15,0.39
1/1/2016 1:30,0.44
1/1/2016 1:45,0.47
1/1/2016 2:00,0.49
1/1/2016 2:15,0.5
1/1/2016 2:30,0.53
1/1/2016 2:45,0.53
1/1/2016 3:00,0.54
1/1/2016 3:15,0.51
1/1/2016 3:30,0.48
1/1/2016 3:45,0.44
1/1/2016 4:00,0.43
1/1/2016 4:15,0.39
1/1/2016 4:30,0.34
1/1/2016 4:45,0.28
1/1/2016 5:00,0.22
1/1/2016 5:15,0.16
1/1/2016 5:30,0.1
1/1/2016 5:45,0.05
```

Figure 2. A sample of data file

**Step #2: Upload your file**

Once you "**Upload"** your file, a message will emerge that your data file has been uploaded successfully (Figure 3).

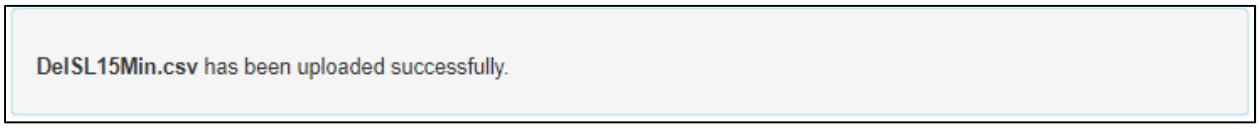


Figure 3. Message once data is uploaded

**Step #3: Define the time zone and data unit of input file**

Choose a "**Time Zone**" and "**Data Unit**" from the drop down menu (Figure 4 and 5). Make sure the selected time zone and data unit are consistent with the data file uploaded. The purpose of defining the input file is to make sure appropriate time zone adjustment and data unit conversion are applied to the control station. This step impacts the computation of 19-year equivalent datums. For more information about time zone, please go to https://www.esrl.noaa.gov/gmd/grad/solcalc/timezone.html.

Time Zone:

- GMT
- Eastern Standard Time: EST-UTC5
- Eastern Daylight Saving Time: EDT-UTC4

- Central Standard Time CST-UTC6
- Central Daylight Saving Time: CDT-UTC5
- Mountain Standard Time: MST-UTC7
- Mountain Daylight Saving Time: MDT-UTC6
- Pacific Standard Time: PST-UTC8
- Pacific Daylight Saving Time: PDT-UST7
- Alaskan Standard Time: AKST-UTC9
- Alaskan Daylight Saving Time:AKDT-UTC8
- Hawaii-Aleutian Standard Time: HST-UTC10
- Hawaii-Aleutian Daylight Time: HADT-UTC9
- Samoa Standard Time: SST- UTC 11

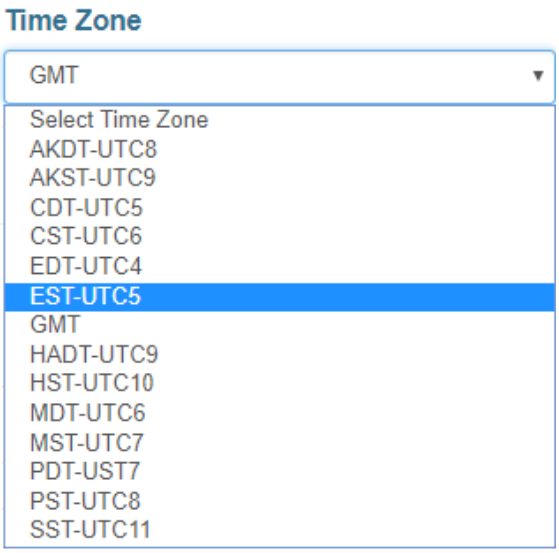

Figure 4. Time zone list

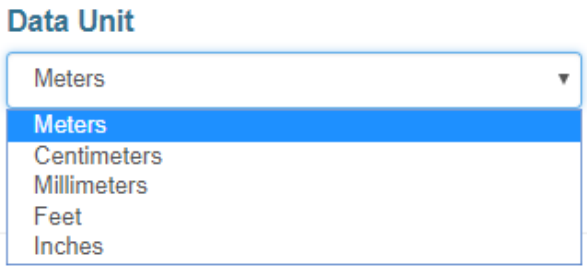

Figure 5. Data unit list

*Note: NOAA collects data in meters, while USGS often collects data in feet.*

**Step #4**: **Choose a control station or not**

Enter the Lat/Long for the user's station and click "**Go**" to activate the next button (Figure 6). The next button is a drop down menu. There are 11 options in the drop down menu. The first

option is "**No Control Station**". Options 2 to 11 are the 10 CO-OPS National Water Level Observation Network (NWLON) or Physical Oceanographic Real-Time System (PORTS) stations that are closest to the entered latitude and longitude. They are in the order of the distance to your station and can be potential control stations to your short-term station.

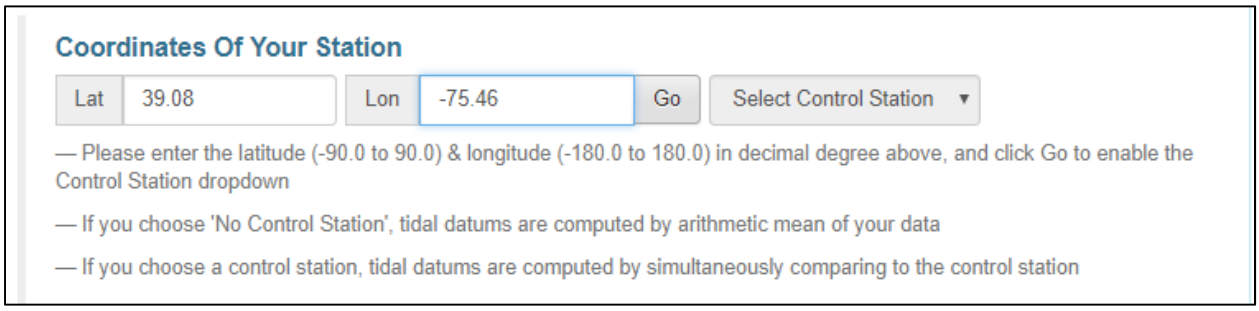

Figure 6. Enter coordinates of your station

*Note: The tool only accepts decimal degree*

**a. Choose "No Control Station"**

Choosing "No Control Station" will allow users to compute tidal datum by averaging the values of each tide parameter over the observation time period (Figure 7), which is called First Reduction Datum (FRED). For example, Mean Higher High Water (MHHW) datum is computed by averaging all higher high values over the observation time period if it is a FRED datum. The FRED datums are not tied to the National Tidal Datum Epoch (NTDE) and better reflect the current sea level condition. However, there is a risk that your tidal datums are computed from a time segment in an anomalous oceanographic and meteorological period and may not accurately reflect the average sea level condition in your area.

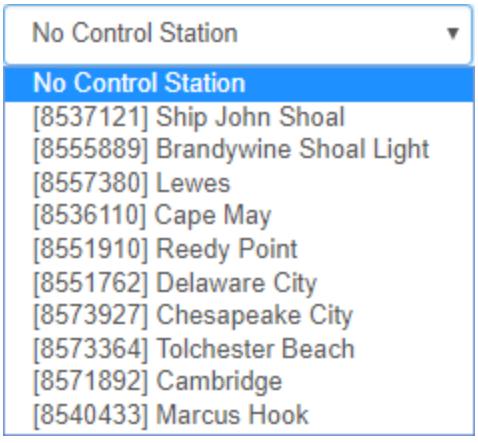

Figure 7. Options of drop down menu

**b. Choose a control station**

If you want to compute an NTDE equivalent datum, you would need to choose a control station. There is a link "Interactive Map to Locate Control Stations" on the tool interface if you want to explore the location of potential control stations near the site (Figure 8). An NTDE equivalent

datum provides the user with the historic perspective of your data associate with the last 19 years. For instance, if tidal datums at a short-term station are computed by simultaneously comparing to a control station on 1983-2001 epoch, tidal datums at the short station are tied to the sea level condition in the middle of 1983 and 2001, which is 1992.

The NOS standard requires 19-year continuous tidal observations for First Reduction tidal datums (FRED) computation. Because of time and resource constraints, First Reduction of tidal datums is not practical at every location along the entire coast where tidal datums are needed. Equivalent NTDE tidal datums are computed for tide stations operating for shorter time periods through comparison of simultaneous data between the short-term station and a long term station (CO-OPS Special Publication No. 1 & CO-OPS Special Publication No. 2). There are two types of simultaneous comparison: Monthly Mean Simultaneous Comparison (MMSC) and Tide By Tide Simultaneous Comparison (TBYT). The tool will automatically determine the type of simultaneous comparison for the data file loaded in.

- Monthly Mean Simultaneous Comparison (MMSC): used for data series that are equal or longer than 1 month
- Tide by Tide Comparison (TBYT): used for data series that are shorter than 1 month

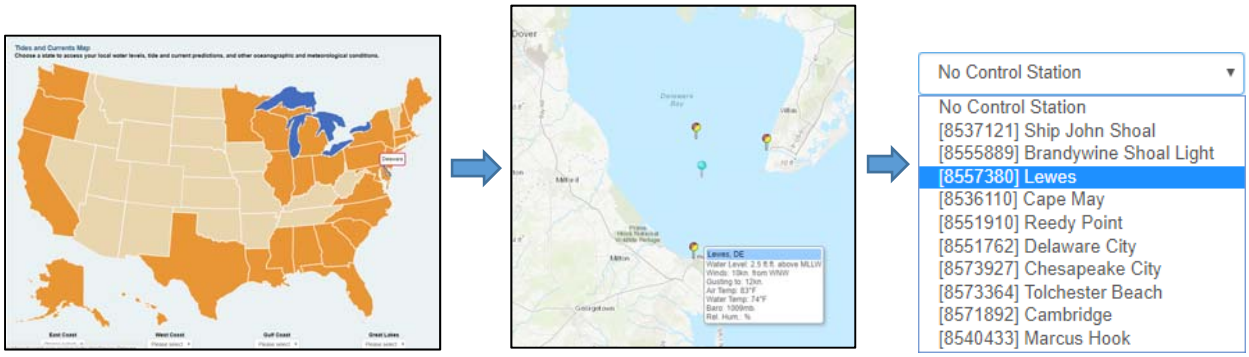

Figure 8. Choose a control station from CO-OPS interactive map

*Note: The nearest control station may not be your best option. Verify stations are in areas with similar tidal estuaries/regimes (i.e. coastal barrier estuary verses a riverine estuary.)*

**Step #5: Calculate datums**

Once you have entered/selected all parameter, you can hit "**Calculate Datums**" to compute either FRED (Figure 9) or 19-year equivalent datums (Figure 10). You can click "**Show Details**" to see the detailed information about the numbers of highs and lows picked, monthly means for each month, computation process, etc. Also, click "**Download Result**" to download the result including computed datums, a highs and lows spreadsheet and monthly plots as a .zip file.

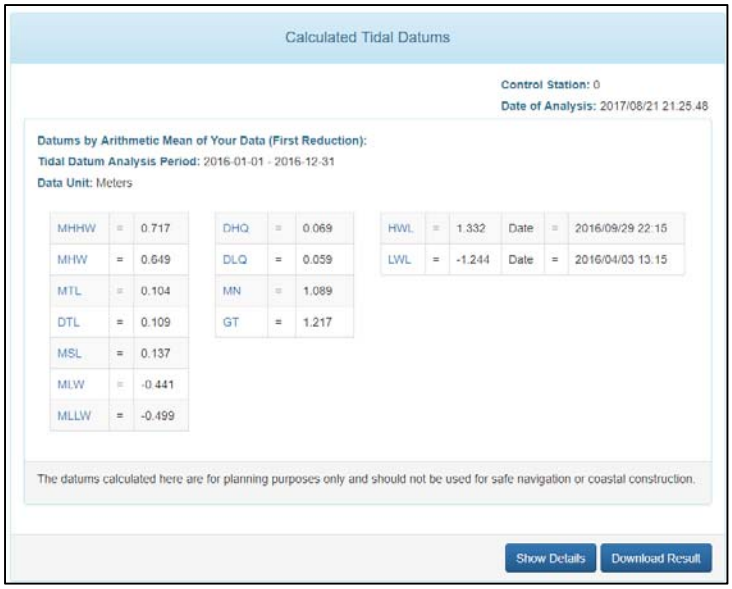

Figure 9. Output example of “Choose No Control” (FRED datums)

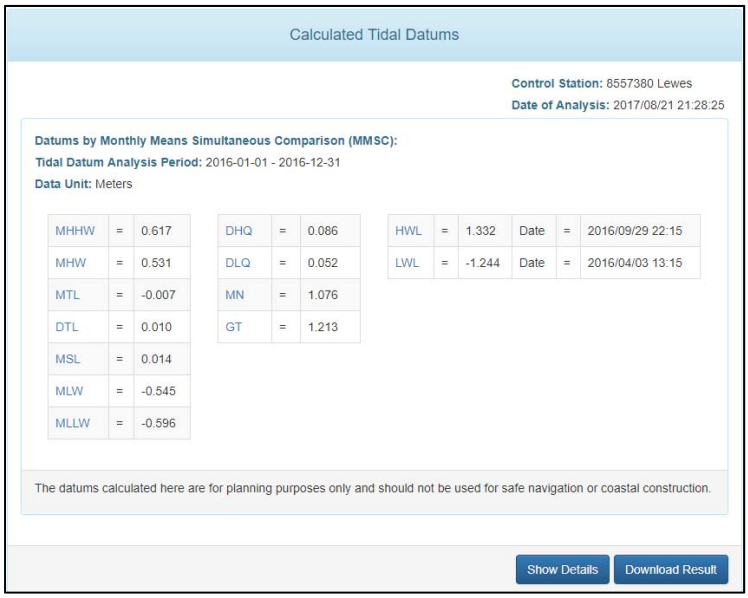

Figure 10. Output example of choosing a control station (19-year equivalent datums)

**References:**

CO-OPS, 2001. Tidal Datums And Their Applications NOAA Special Publication NOS CO-OPS 1. http://www.tidesandcurrents.noaa.gov/publications/tidal_datums_and_their_applications.pdf

CO-OPS, 2003. Computational Techniques For Tidal Datums Handbook, NOAA Special PublicationNOSCo-Ops2. https://www.tidesandcurrents.noaa.gov/publications/Computational_Techniques_for_Tidal_Datums_handbook.pdf

Have Suggestions & Feedback? Try our **Feedback and Suggestions** box.