

# INUNDATION ANALYSIS USERS' GUIDE

## Introduction

The inundation analysis tool provides frequency and duration of inundation statistics above a specified threshold elevation at a given location using observed data from the NOAA Center for Operational Oceanographic Products and Services' tide stations. The analysis uses six-minute interval time series, with observed times and heights of high waters (tides). Initially developed by the CO-OPS Coastal Oceanographic Applications and Services of Tides and Lakes (COASTAL) Program for the purposes of marsh restoration and planning, the program potentially has broader applications for the coastal engineering and mapping community, including analyzing return frequencies for coastal flooding threshold elevations and/or user specified datum elevations.

## Input & Output Summary

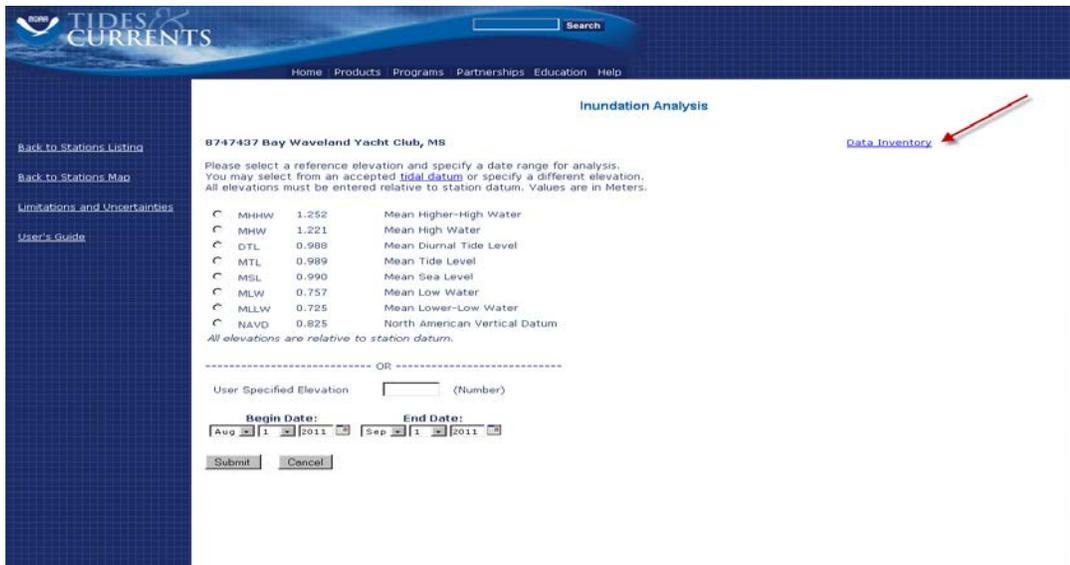
The input for this program are 6-minute water level time series data and the tabulated times and heights of the high tides over a user specified time period, relative to a selected tidal datum or user-specified datum for a specific station. The program outputs summary statistics, which include the number of occurrences of inundation above a threshold (i.e., events) during the specified time period and the duration of each event. In addition to the summary statistics, this program provides graphical output in the form of three plots. The first is a histogram showing frequency of occurrence relative to threshold elevation, the second is a histogram showing frequency of duration of inundation, and the third is an X-Y scatter plot showing frequency of elevation versus duration of inundation for each event. Input data time series are presently limited to the verified data from a set of operating and historical tide stations in the NOAA CO-OPS data base. A data inventory link located in the top right hand corner of the station's page can be used to query the database.

## Step-by-Step

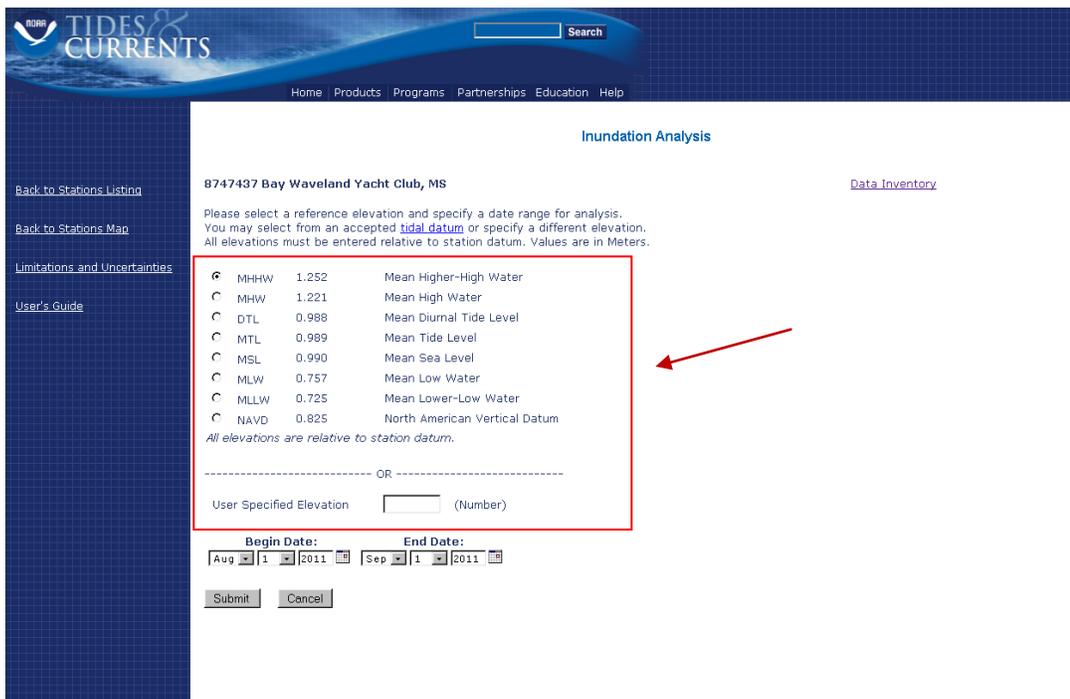
1. Select a station icon from the station map on the Inundation Analysis home page. Then click the option for **Inundation Analysis**. This will display the specified station page for the analysis.



2. Use the **Data Inventory** option to query the database for data availability. This page will display begin and end dates for verified 6-minute water level data. However, it will not show the occurrence of any data breaks or gaps.



3. Select a reference elevation from the list of accepted tidal datum elevations or enter a user specified threshold elevation.



- Specify date range for analysis by selecting a begin date (Month/Day/Year) and end date (Month/Day/Year), then click the Submit button.

\*Data may be queried for a maximum date range of five years.

\* If there are gaps or breaks in the data, or data do not exist for the date range specified, a warning will appear stating that there were gaps in the data and will include the date and time range of the break(s).

After the chosen parameters have been entered, a spreadsheet will appear that will include:

- Station name and ID
- The time period selected
- Reference datum and value
- Number of high tides analyzed
- Total hours of inundation above specified elevation
- If applicable, the number of missing 6-minute data points over the selected time period.

The spreadsheet itself has 6 columns:

- Period Start – the time at which the water level rose above the specified datum
- Period End – the time at which the water level dropped below that point of reference (based on a 6-minute average)
- Time of High Tide - point at which, during the event interval, the actual peak in the tidal curve was reached
- Tide Type – the type of tide occurring during inundation
- Elevation above Datum (in meters)
- Duration of Inundation (in hours)

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**Inundation Analysis**

**Inundation Analysis**  
 8747437 Ray Wavoland Yacht Club, MS  
 From 2011-08-01 To 2011-09-01  
 Reference Datum = 1.252 Meters ( MHHW )  
 17 High Tides Analyzed 92.7 Total Hours Inundated

**Available Plots**  
[Frequency of Elevations](#)  
[Frequency of Durations](#)  
[Duration vs Elevations](#)

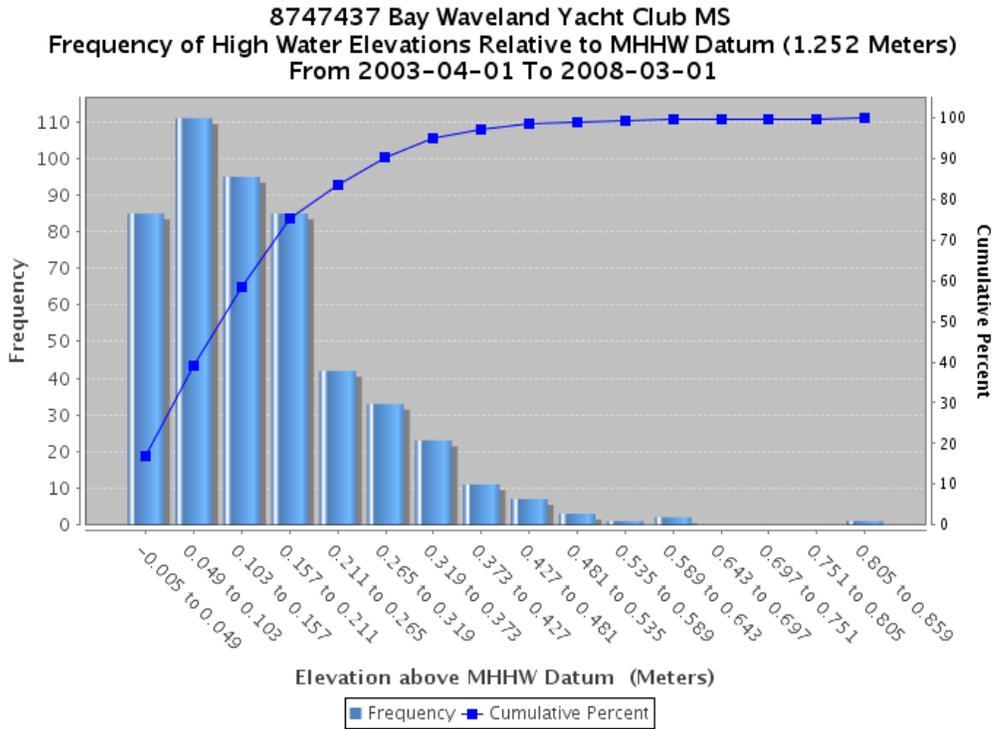
Period Start	Period End	Time of High Tide	Elevation (Meters) Above Datum	Tide Type	Duration
2011-08-01 15:10	2011-08-01 21:10	2011-08-01 16:10	0.140	HH	6.0
2011-08-02 17:36	2011-08-02 21:30	2011-08-02 19:18	0.083	HH	3.9
2011-08-06 07:30	2011-08-06 14:30	2011-08-06 13:00	0.164	HH	7.0
2011-08-06 06:10	2011-08-06 13:10	2011-08-06 09:54	0.226	HH	7.8
2011-08-07 06:30	2011-08-07 13:12	2011-08-07 10:30	0.118	HH	6.7
2011-08-08 09:24	2011-08-08 13:30	2011-08-08 11:24	0.047	HH	4.1
2011-08-20 07:24	2011-08-20 09:12	2011-08-20 08:10	0.009	HH	1.8
2011-08-21 07:54	2011-08-21 10:48	2011-08-21 09:30	0.034	HH	2.9
2011-08-22 06:42	2011-08-22 12:18	2011-08-22 09:42	0.101	HH	5.6
2011-08-23 08:30	2011-08-23 13:42	2011-08-23 11:30	0.070	HH	5.2
2011-08-24 09:12	2011-08-24 16:00	2011-08-24 12:54	0.180	HH	6.8
2011-08-25 08:24	2011-08-25 18:12	2011-08-25 13:30	0.176	HH	9.8
2011-08-26 11:36	2011-08-26 18:24	2011-08-26 15:18	0.099	HH	6.8
2011-08-27 14:24	2011-08-27 19:06	2011-08-27 16:42	0.113	HH	4.7
2011-08-28 15:00	2011-08-28 20:30	2011-08-28 18:06	0.093	HH	5.5
2011-08-29 15:00	2011-08-29 20:48	2011-08-29 17:12	0.113	HH	5.8
2011-08-30 18:10	2011-08-30 21:24	2011-08-30 20:18	0.013	HH	3.1

At the top right hand corner of the page is a selection of three plot options to graphically display summary statistics for contents of the spreadsheet.

These three options are:

1. Frequency of Elevations
2. Frequency of Durations
3. Duration vs. Elevation

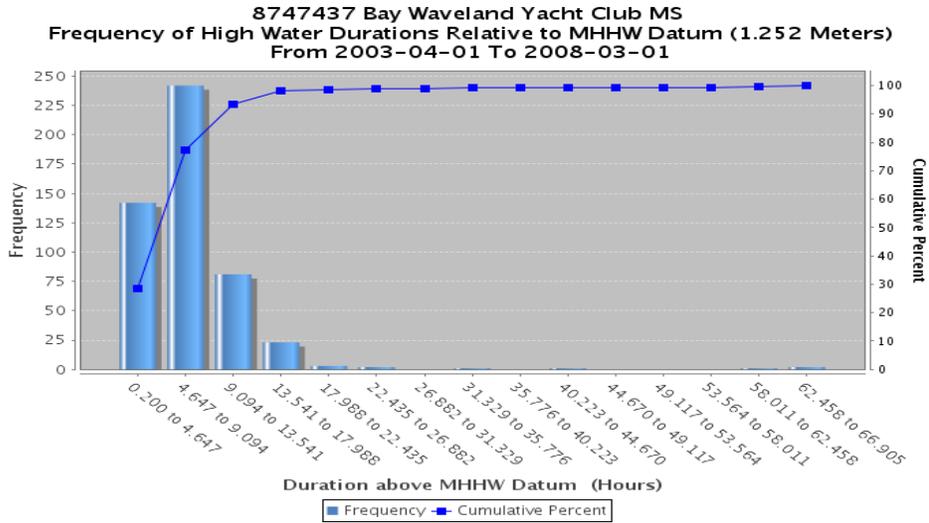
**Frequency of Elevations** - A histogram will be generated with frequency on the Y axis and elevation bins above user datum on the X axis. There is also a cumulative percent curve with a scale on the right side of the plot. Default frequency distribution parameters are maximum elevation, minimum elevation, and increment. To enter values other than the default parameters, select the **Please click here to use other values** option, which is located below the plot. Enter the minimum and maximum values and the plotting increments. Then click the **Submit** button. A tabular representation of this plot is added below the original spreadsheet with three columns, which display the frequency of elevations data: Range (in meters), Frequency of Elevations, and Cumulative Frequency.



The graph was generated using these values (Meters)  
 Min -0.0050 | Max 0.812 | Increment 0.054

[Please click here to use other values](#)

**Frequency of Durations** - The frequency appears on the Y axis and the duration for each bin exceeding the threshold above the specified datum (measured in hours) on the X axis. The cumulative percentage is represented along the right vertical axis. Similar to the Frequency of Elevations plot, an option to enter the minimum and maximum values and plot increments is located below the plot. To manipulate these values, select the **Please click here to use other values** option. A tabular representation of this plot is also added below in three columns which display the frequency of durations: Range (in hours), Frequency of Elevations, and Cumulative Frequency.



The graph was generated using these values (Meters)  
 Min 0.2 | Max 66.9 | Increment 4.447

[Please click here to use other values](#)

**Duration vs. Elevation** – Automatically generated X-Y scatter plot, showing the relationship between elevation of the tide and its duration above the specified threshold, with duration of inundation plotted along the Y axis, and the elevation above the specified datum (in meters) shown along the X axis. This plot does not allow user-specified parameters and a tabular representation is not generated.

