Alaska Local Tidal Datums

An introduction for non-experts

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What is a vertical datum?

A vertical datum is a reference surface that can be used to measure heights in a uniform way.

How much taller is Sally?

Need to know how tall the hill is!

… you cannot compare heights that are measured from different surfaces.

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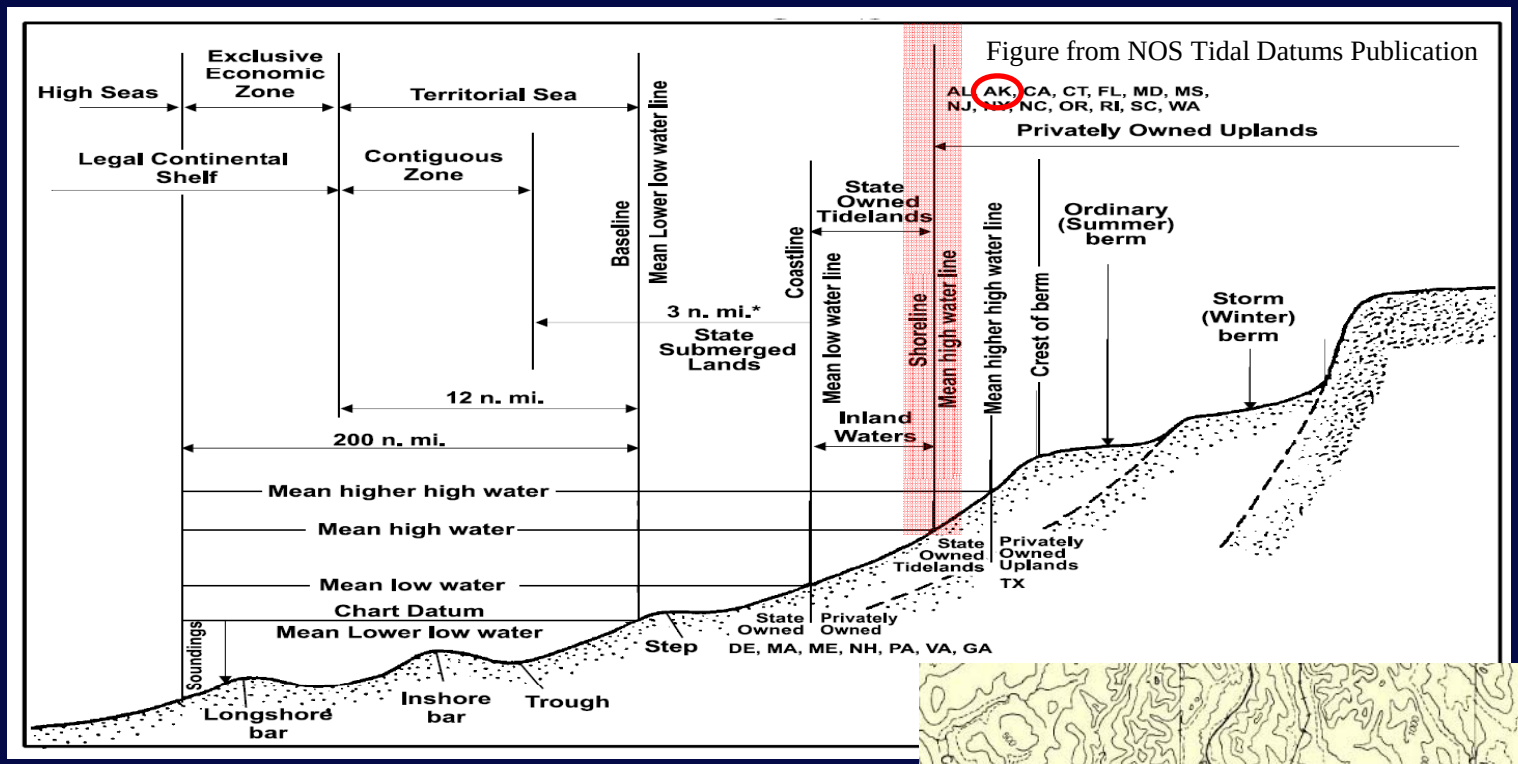
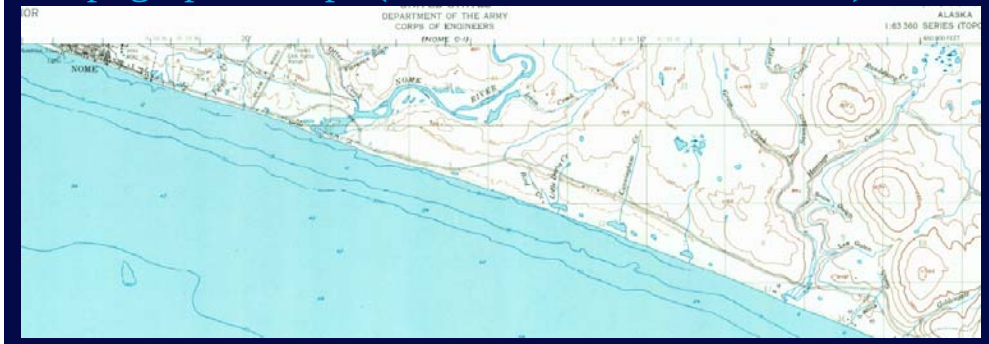
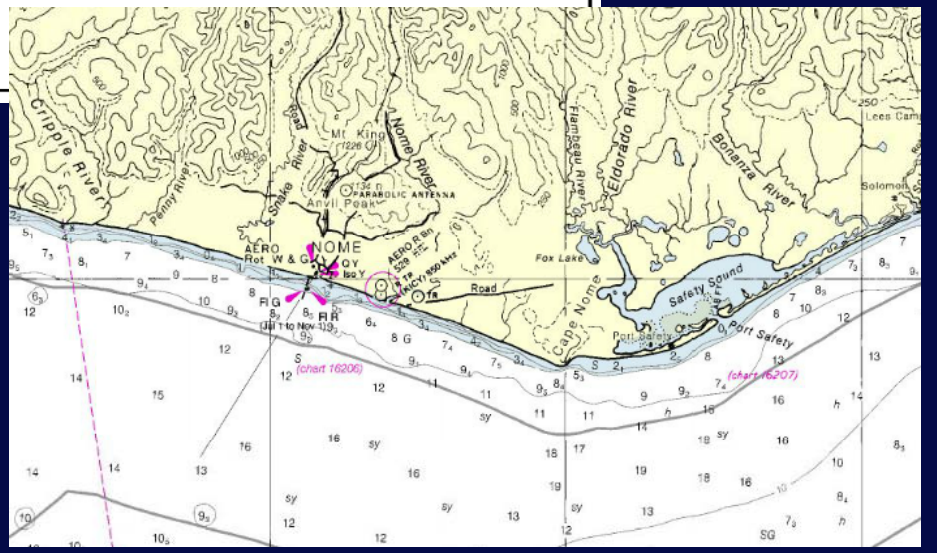
Examples of vertical datums at the coast



Land Ownership

Topographic Maps ("NVGD29" or "NAVD88")



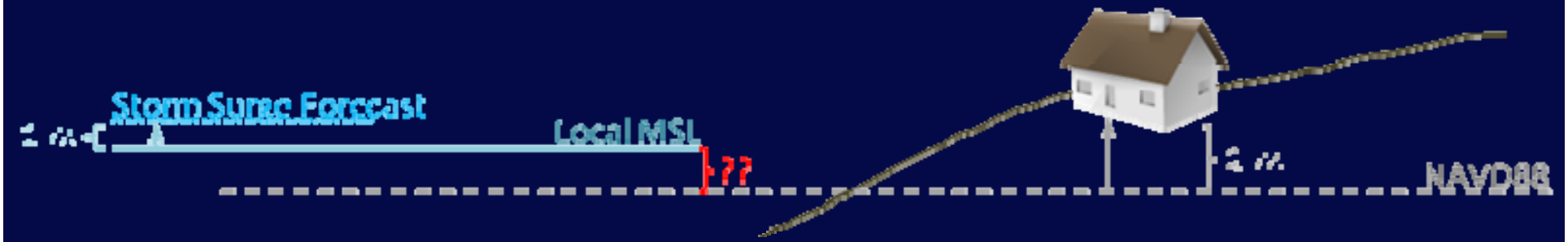


Nautical Charts (MHW elevations, depths in MLLW)

Why are datums important to me?

Tidal Datums
(standardized local sea levels)

Geodetic Datum
(NAVD88 = current standard in U.S.)



Scenario

You own a house at a published elevation: 2 meters above the NAVD88 reference plane

The National Weather Service issues a forecast for a storm surge that will be: 1 meter above your local Mean Sea Level

If your local Mean Sea Level is higher (1.5 m for example) than NAVD88 you may need to take action!

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Understanding this relationship in coastal areas is necessary for:
flood warnings, inundation mapping, design elevations

What is ‘NGVD88’ and where does it come from?

History Lesson:

First standardized vertical datum in US was ‘NGVD29’

“Sea Level Datum of 1929”

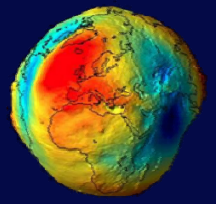
26 tide stations in US and Canada

NAVD88 (1988)

ONE tide station is used as the reference MSL →

Why does local MSL differ?

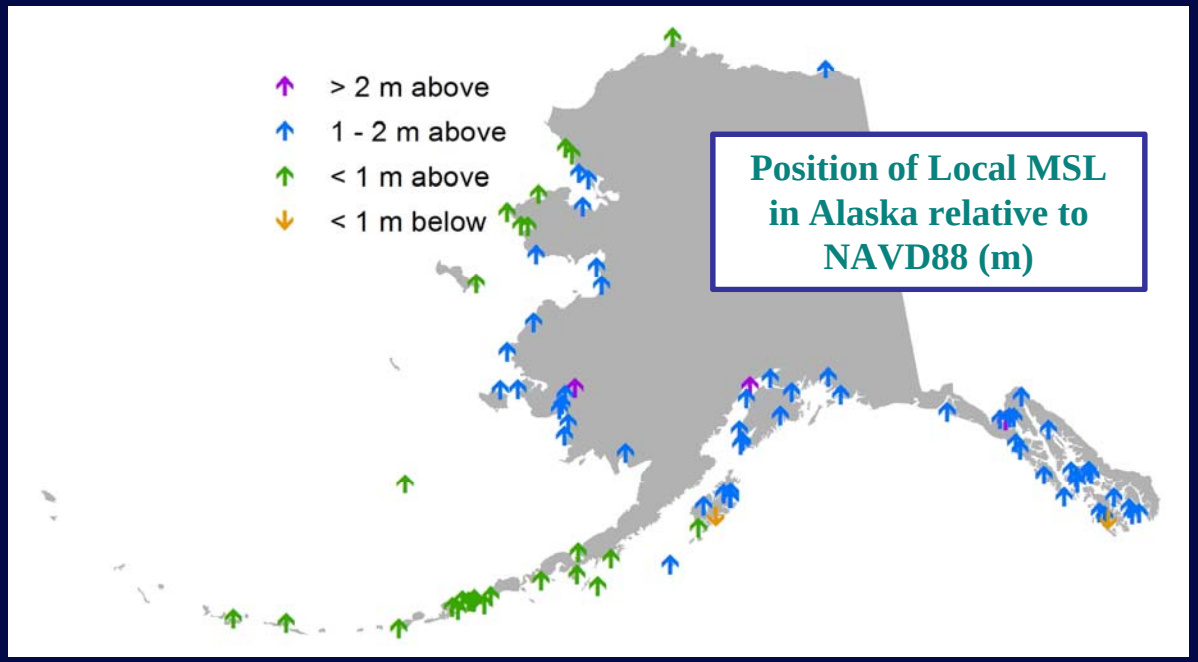
- Incomplete map of earth’s gravity field = GEOID12A



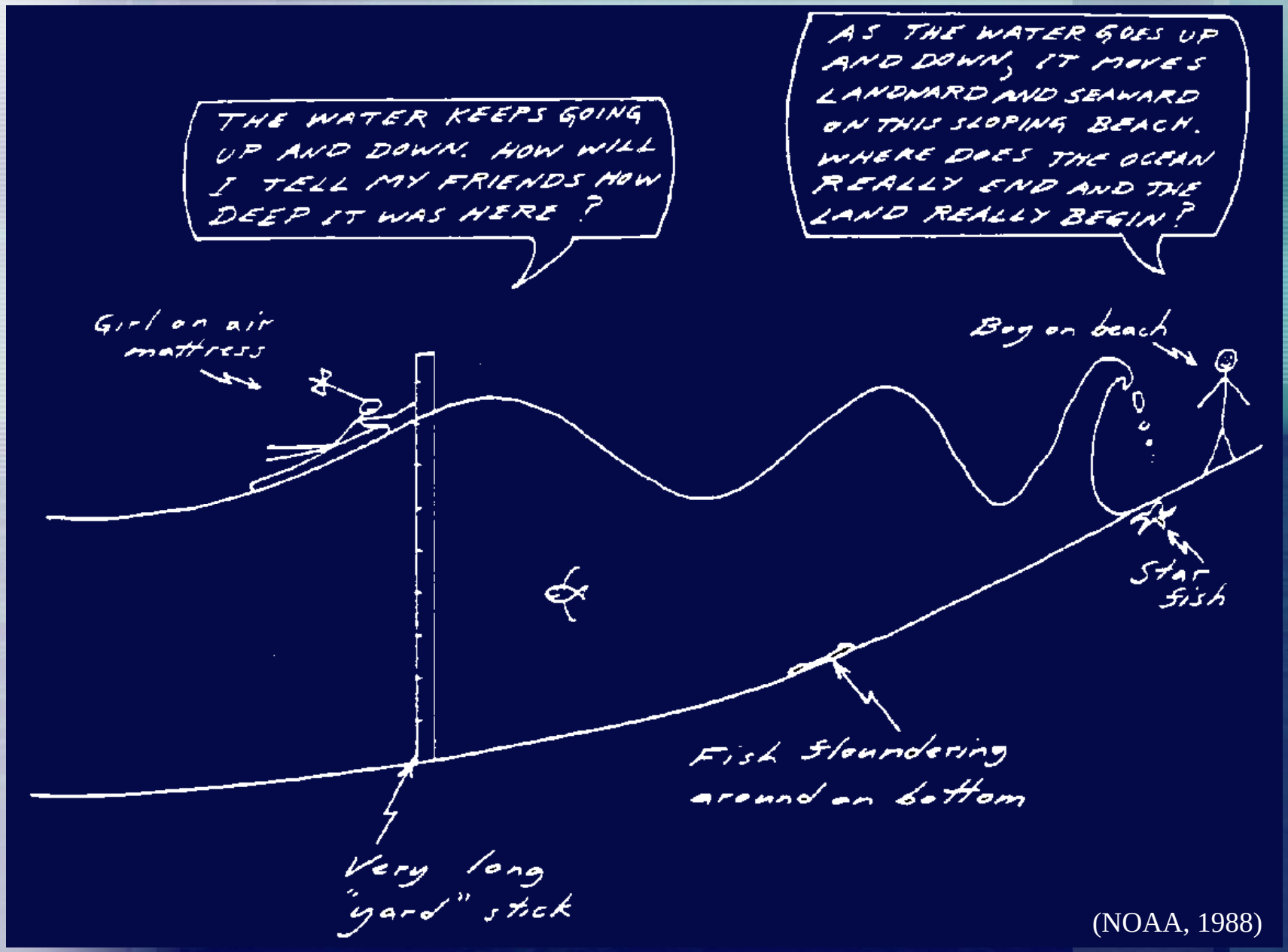
- Sea surface topography is driven by oceanographic and atmospheric effects

NAVD88 "MSL" ≠ Local MSL

Please spread the word!



How are tidal datums determined?

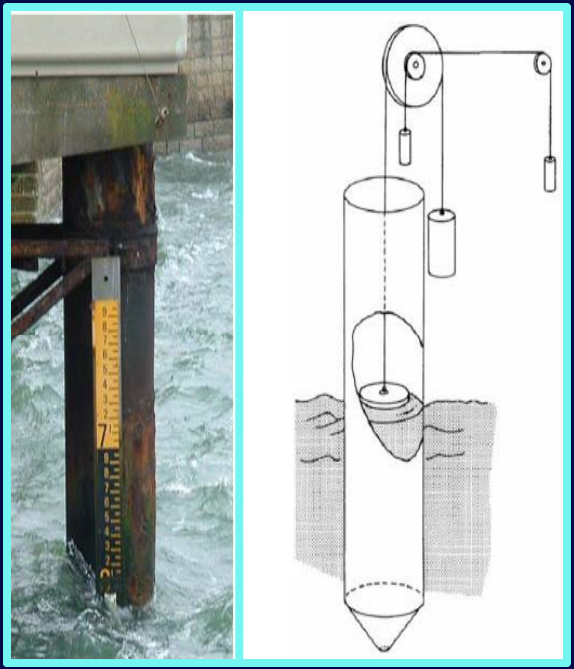


(NOAA, 1988)

Water level measurement at tide gauges

Tide Stations

Older methods:

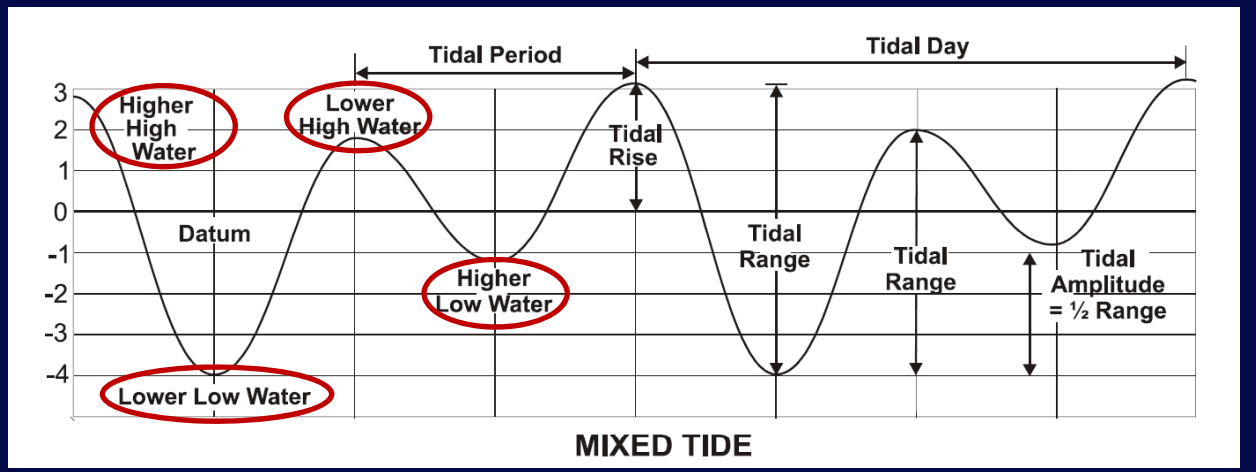


The official network of tide stations for the United States is maintained by

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

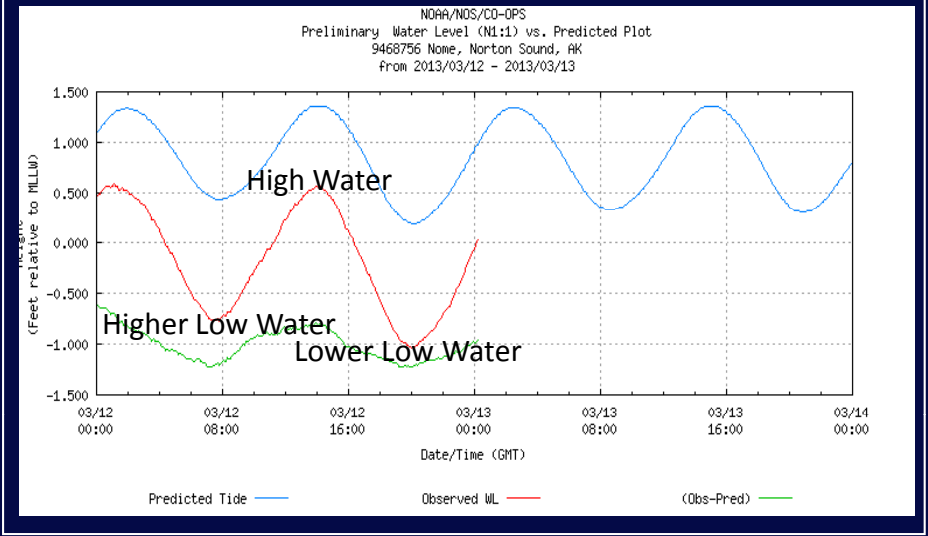
Modern Methods:

- Bubbler Gauge
- Pressure Transducer
- Acoustic Gauge
- Radar Gauge

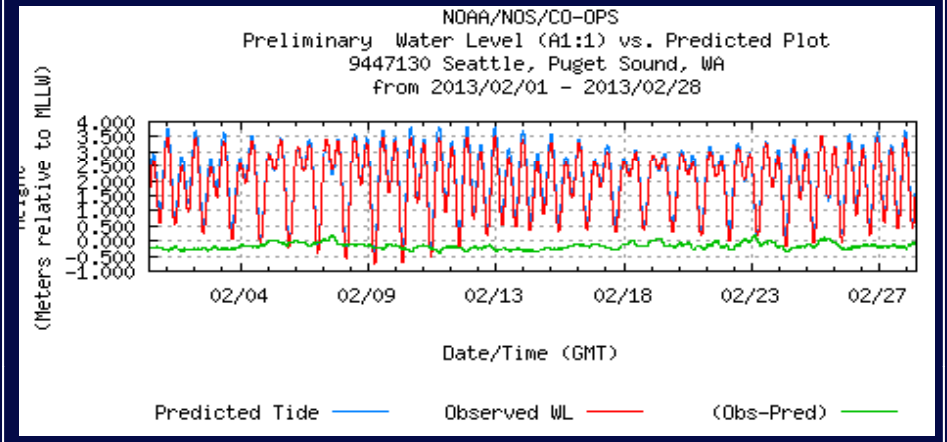


Real tide station records

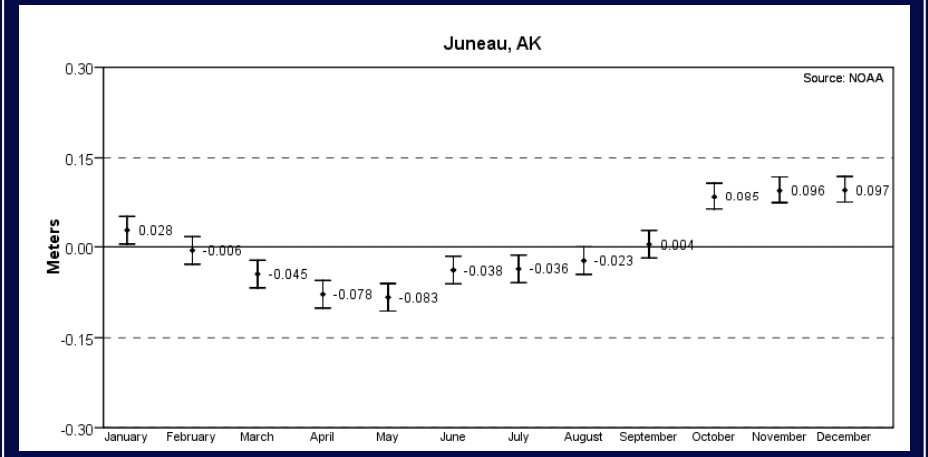
Day



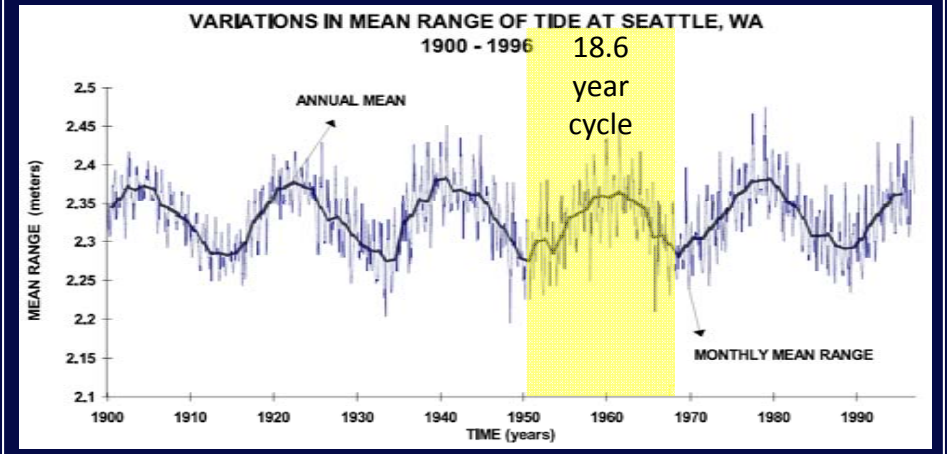
Month



Year



Century



Tide records include: Wave & wind effects - Ocean & river currents - Temperature and salinity – Atmospheric pressure

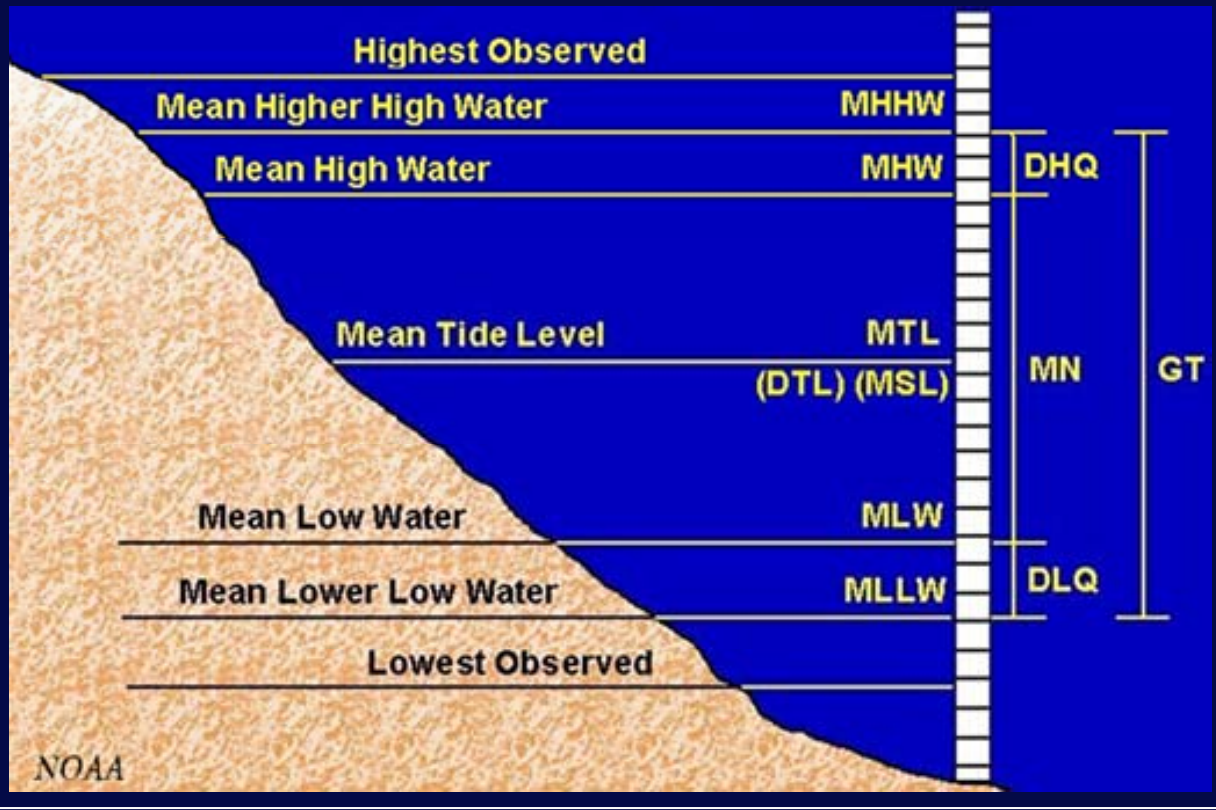
Long-term averaging = Tidal Datums

Tidal Datums

Examples:

Local MHW - Average of the high water levels at a location over a 19-year period (1983-2001)

Local MSL - Average of hourly water level measurements over a 19-year period



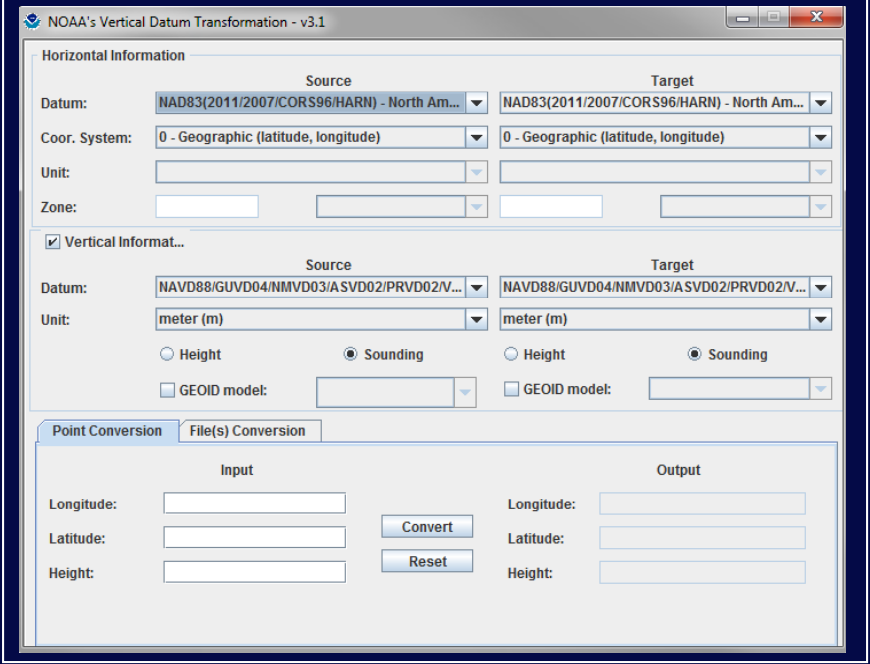
Datum Conversion

In most of USA

NOAA's VDatum tool

Uses a continuous sea surface grid (TSS) to make transformations

Available in all contiguous states, Puerto Rico and the US Virgin Islands

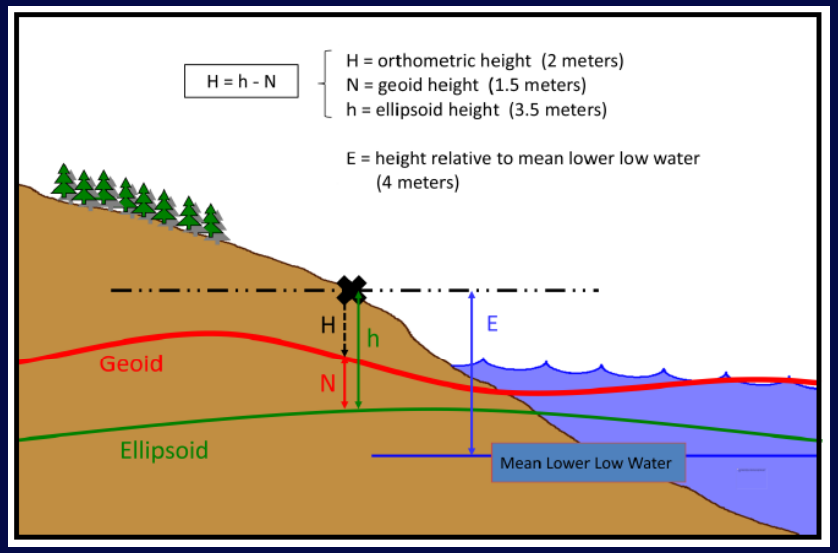


In Alaska

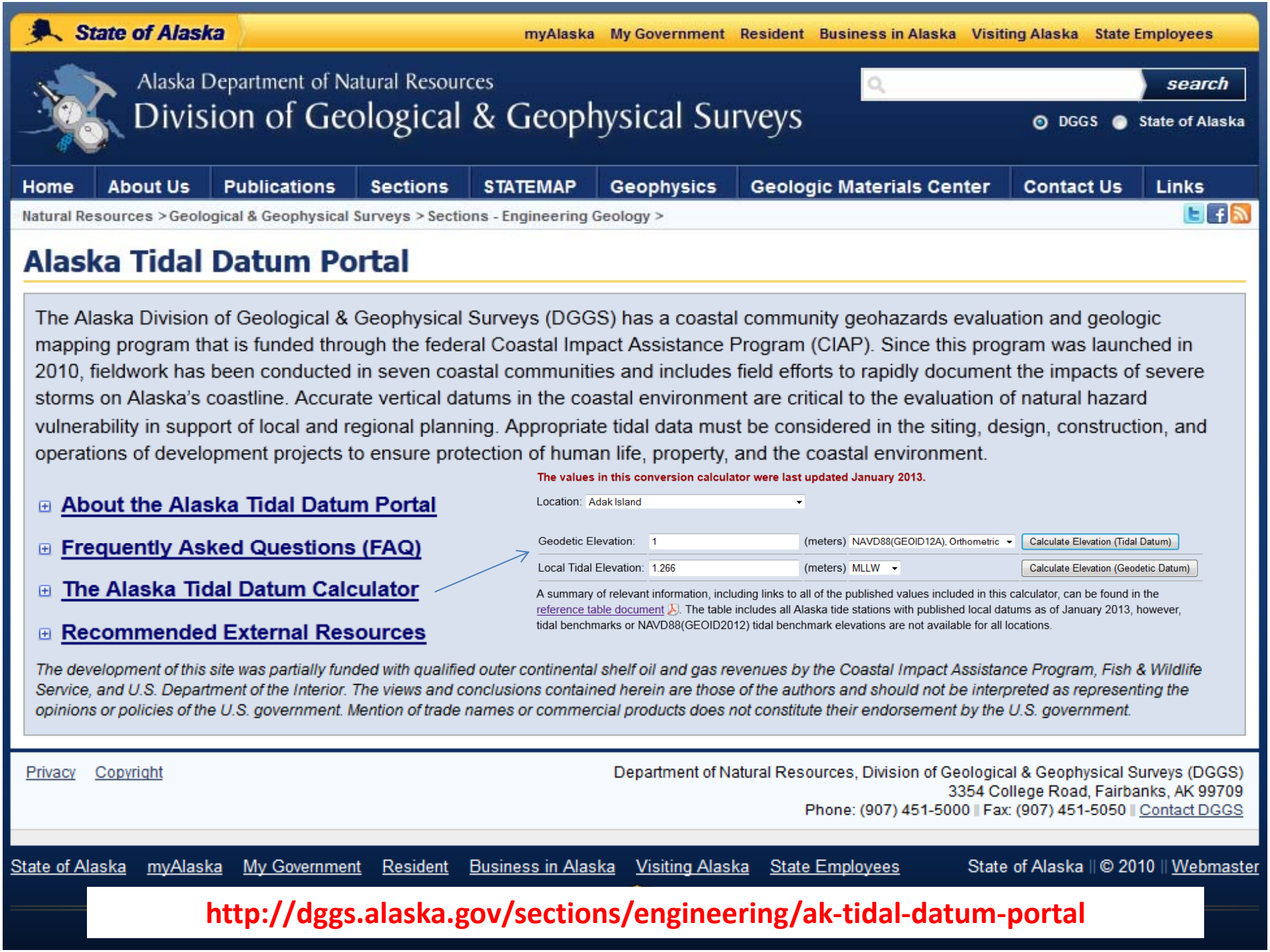
Sole-station offset transformations

Require:

- Tidal Datums (19-year averages)
- Tidal Benchmarks w/ published geodetic heights

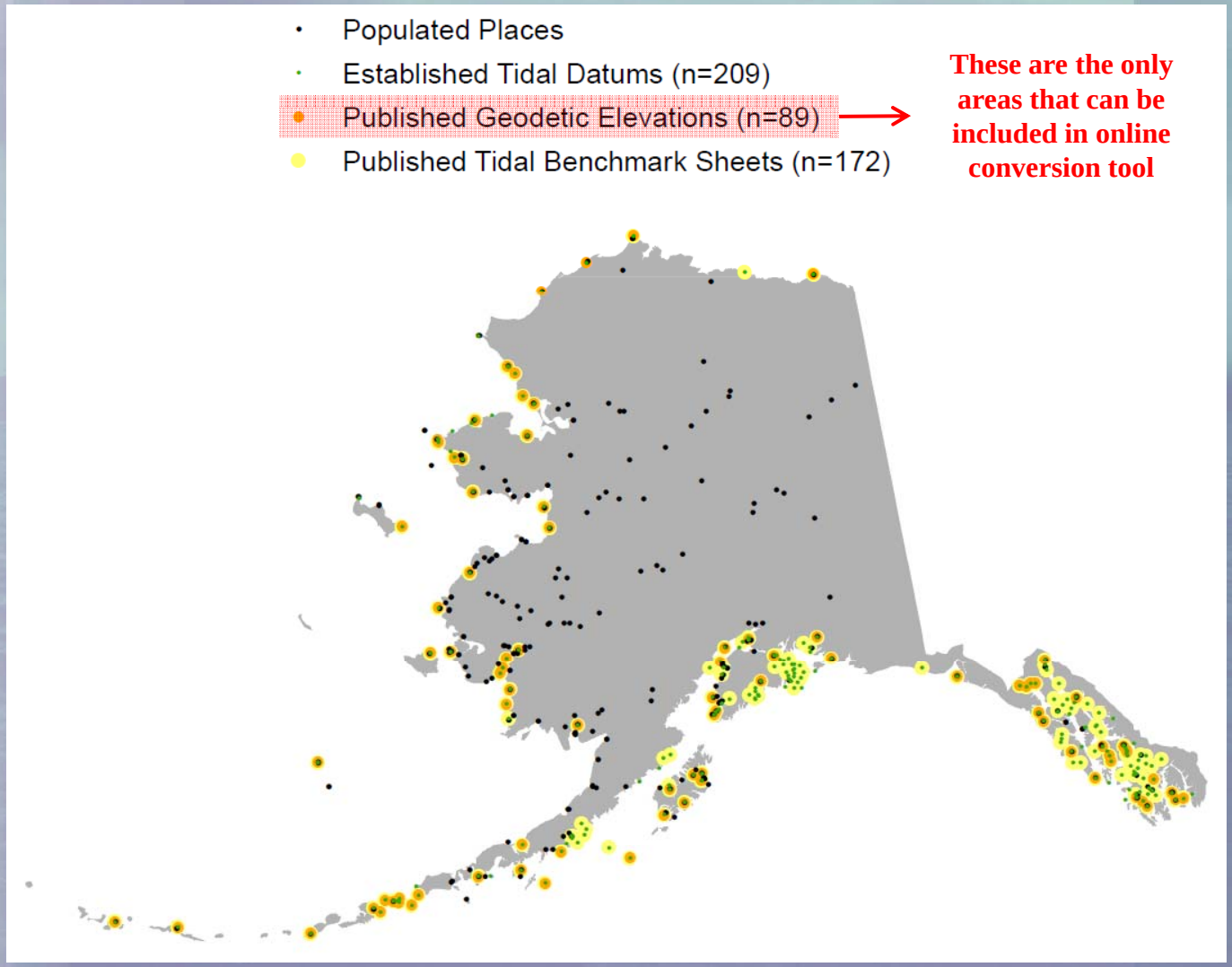


NOTE: elevations obtained using this method are only valid in the immediate vicinity of the original tide station



http://dggs.alaska.gov/sections/engineering/ak-tidal-datum-portal

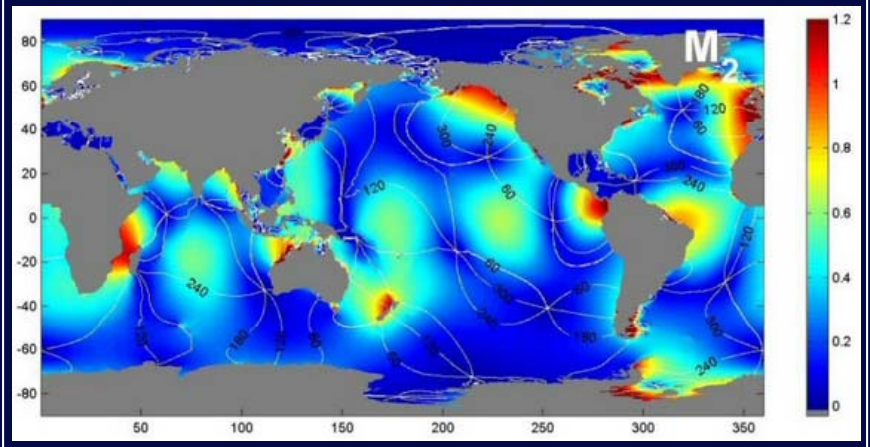
January 2013 Status of Local Tidal Datums in Alaska



Surrogate Tidal Datum Estimates

Temporary Tide Gauge

Modeled Value

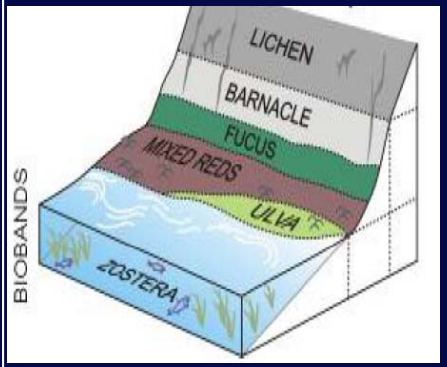


Measurement of Foreshore Features

For example:

Strandlines – debris lines

Biological bands



For more information or to make conversions visit:
www.dggs.alaska.gov/sections/engineering/ak-tidal-datum-portal/

In conclusion:

- **Any time you encounter an elevation or height (3 feet for example) be sure to ask *"3 feet above WHAT?"***

If the answer is height above 'Mean Sea Level', is it:

1. **The National Standard Sea Level (NAVD88)**
2. **Local Mean Sea Level (based on tide gauge)**
3. **Local Mean Sea Level (based on something else)**

→ **If it is Local Mean Sea Level, when was it calculated?**

- **Different 'types' of Mean Sea level can vary by up to 7 feet in Alaska.**

Thank You!