

Submitting Shorelines to the CUSP

ACMS December 2020

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NOAA Shoreline Data Explorer

National Geodetic Survey

Home Tools Surveys Science & Education



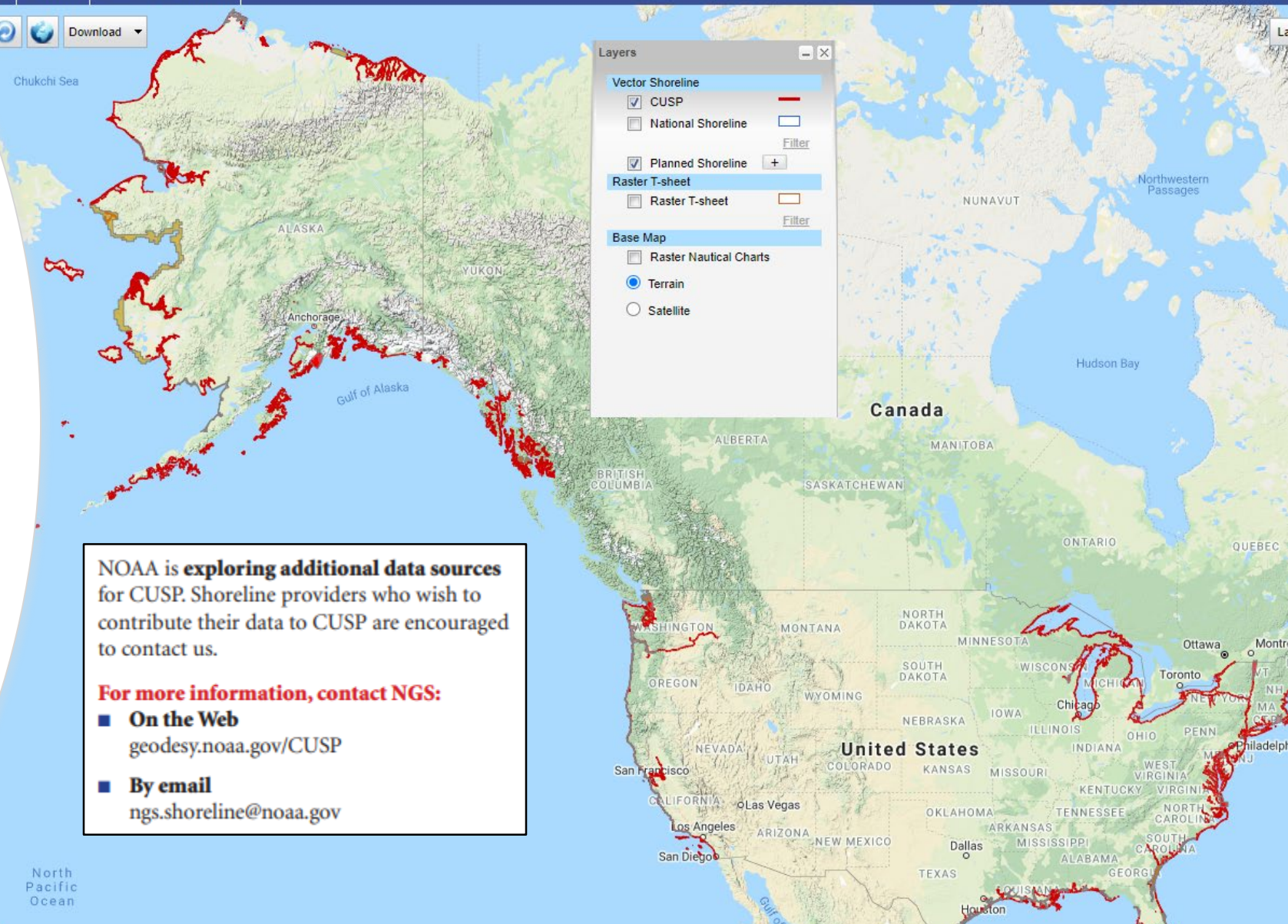
Continually Updated Shoreline Product (CUSP)

- Maintained by NOAA
- Continuous shoreline
- Best resource for most up-to-date shoreline vector
- Referenced to Mean High Water where applicable
- Attributed shoreline features

<https://www.ngs.noaa.gov/CUSP/>

Point of Contact:

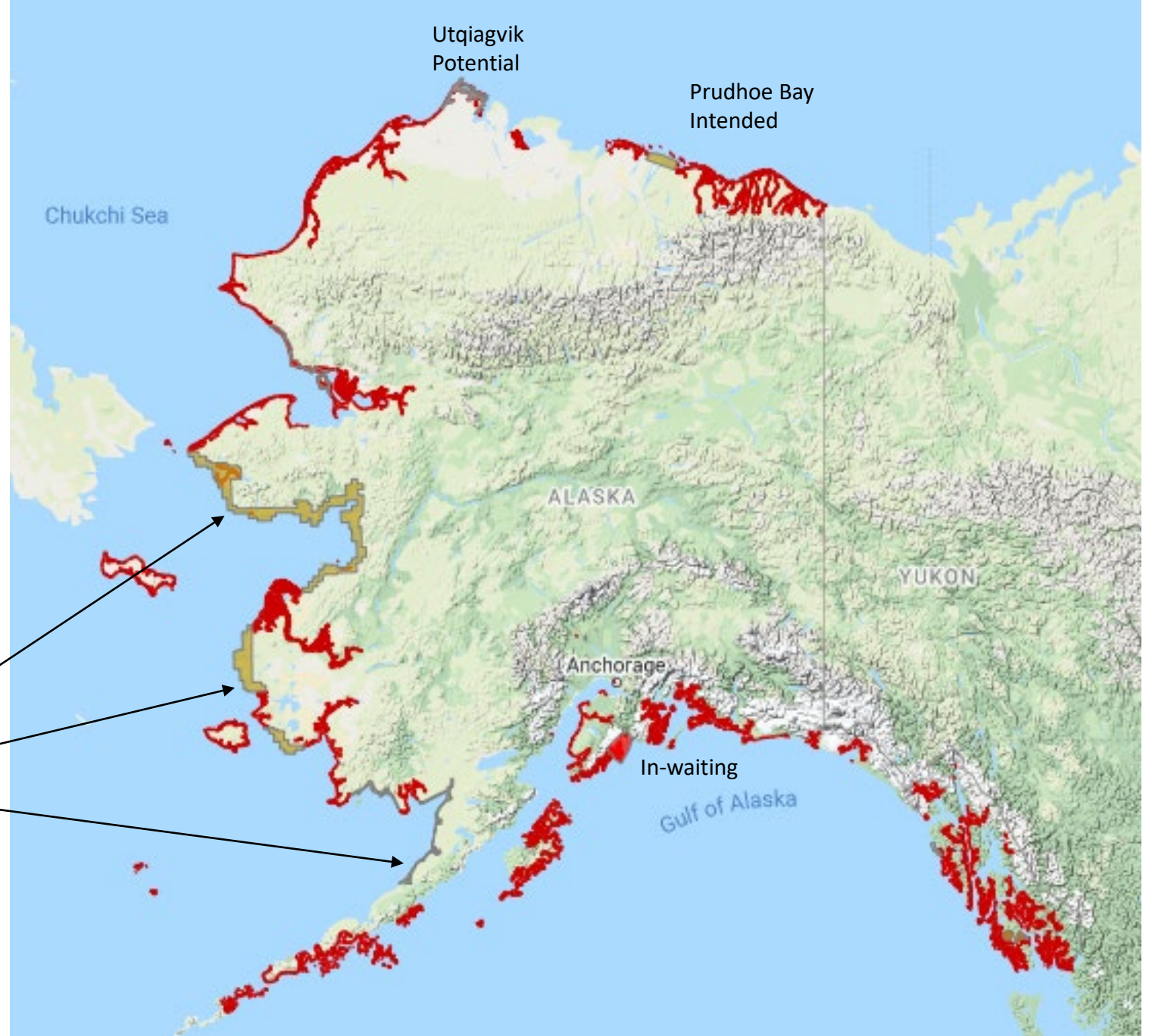
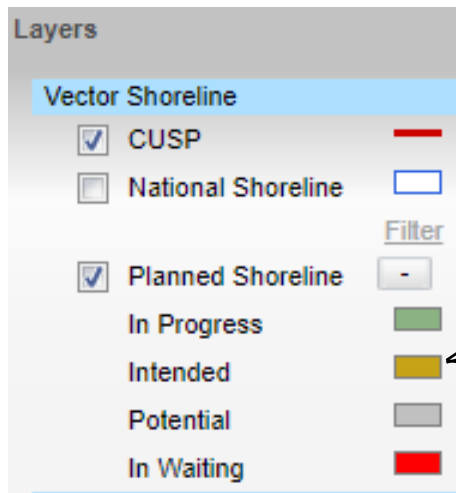
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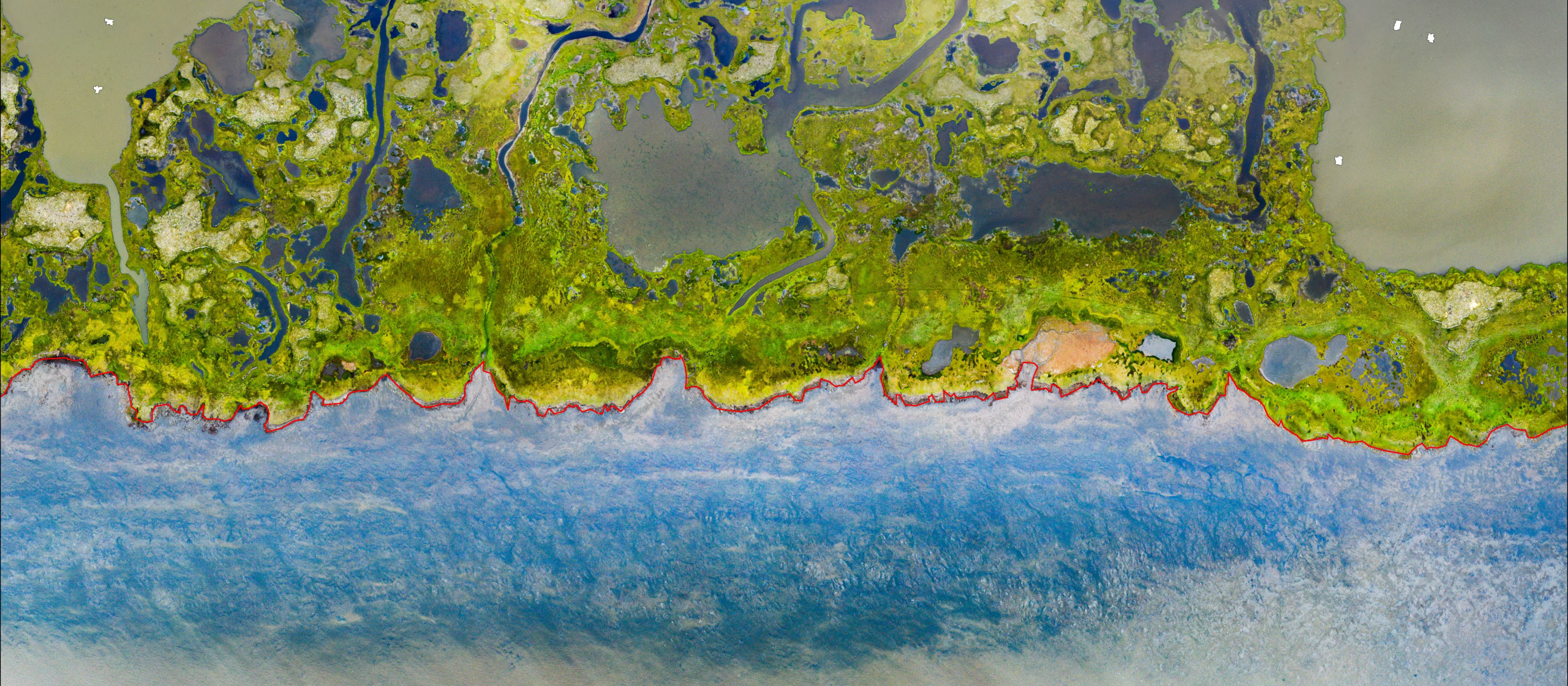


Status of CUSP in Alaska

As of December 2020

- 56% complete
- Average age is 12.4 years

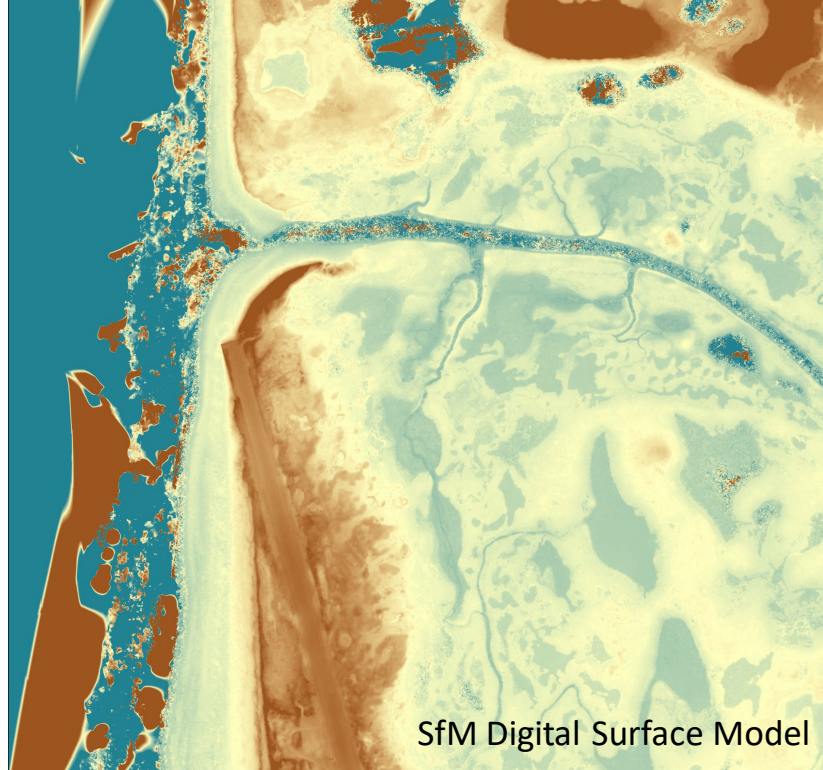




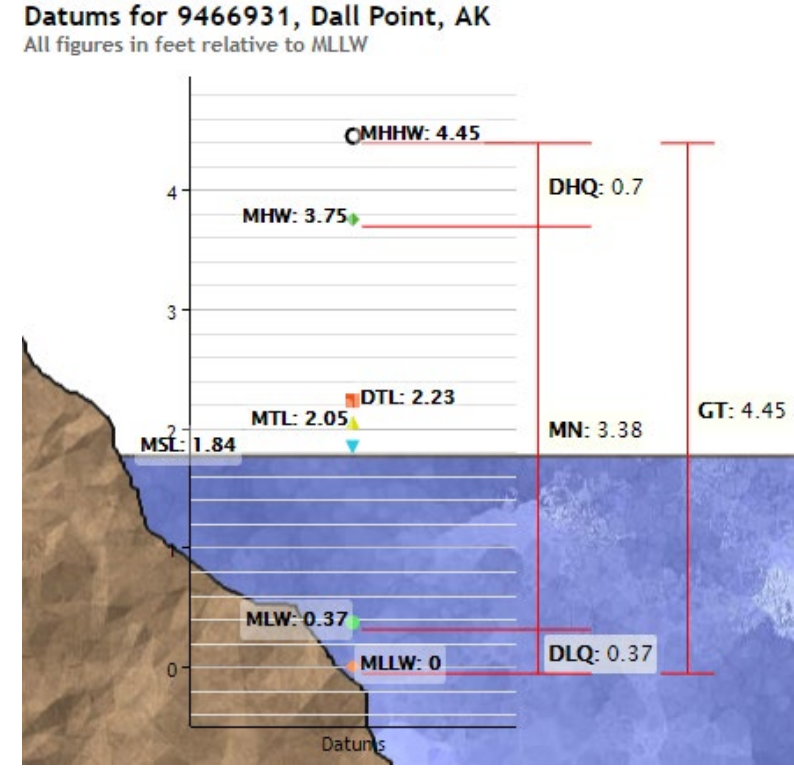
Identifying Shorelines with Readily Available Data



Orthoimagery



Digital Elevation Model



Tidal Datum

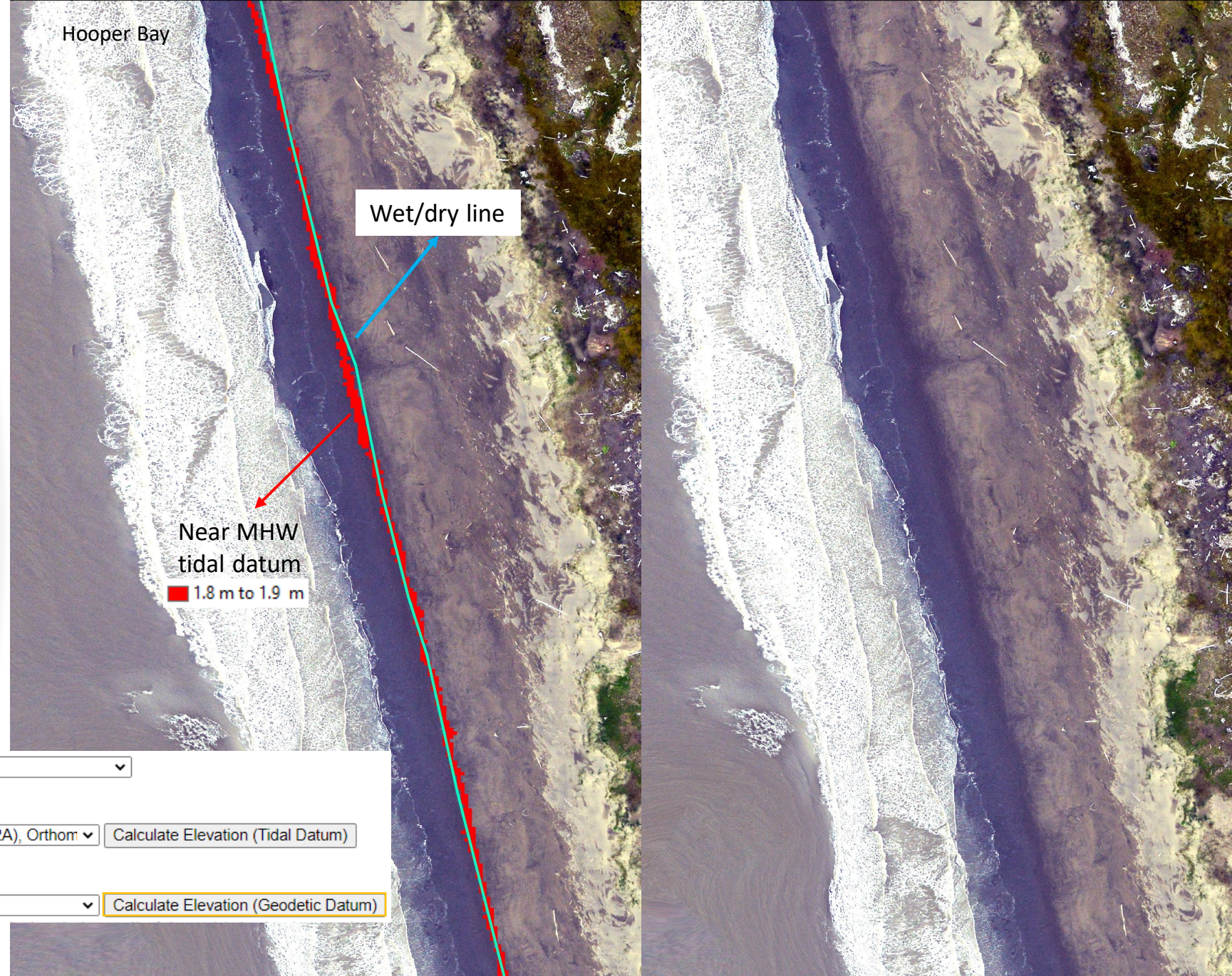
Source Data for Delineating Shorelines

- Orthoimagery : Feature-Based
 - Primary source and majority of Alaska shoreline
- Elevation Data : Datum-Based
 - Tidal datums used to extract shoreline position from elevation models
 - Alaska Tidal Datum Portal converts tidal predictions to land-based datums

Identifying Shorelines

CUSP referenced to Mean High Water (where applicable)

- Within 20 meters
- Datum-Based
 - Tidal datums not continuous but can be used to inform visual interpretation of region
- Feature-Based (Datum Proxy)
 - MHW as wet/dry line



Location:

Geodetic Elevation:
 (meters)

Local Tidal Elevation:
 (meters)

Identifying Shorelines

- Many possible shorelines
 - Sediment color, wrack lines
- Tide datum tool informs decision on choosing line.



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State of Alaska / Natural Resources / Geological & Geophysical Surveys / Geologic Hazards / Coastal Hazards

Alaska Tidal Datum Portal

Unambiguous vertical datums in the coastal environment are critical to the evaluation of natural hazard vulnerability in support of local and regional planning. Appropriate tidal data must be considered in the siting, design, construction, and operations of development projects to ensure protection of human life, property, and the coastal environment.

The NOAA Center for Operational Oceanographic Products and Services (CO-OPS) provides infrastructure and expertise for all verified tidal measurements and is the ultimate authority on tidal datums in the United States. NOAA's National Geodetic Survey maintains the National Spatial Reference System (NSRS) that is used to relate tidal datums to geodetic datums. The minimal record of water level measurements and limited survey control in our state prevents the widely-used YDatum program from being available for most of Alaska's coast. DGGS has identified a critical need to improve awareness and facilitate access to tidal datum information in Alaska during this interim period.

Help update the Tidal Datum Portal, improve the National Spatial Reference System, and facilitate public access to Alaska benchmarks by collecting GPS data and making a contribution to the shared Online Positioning User Service (OPUS) database.

Alaska Tidal Datum Calculator

This conversion calculator is provided as a convenience to facilitate access to vertical measurements that have been independently verified and are freely available from either NOAA CO-OPS or NOAA NGS. For rigorous emergency, planning or construction purposes, users are strongly advised to consult these original sources to ensure accurate and up-to-date transformations. All calculations are based on single tide station offsets, elevations obtained using this method are only valid in the immediate vicinity of the original tide station. Because the relationships between local tidal and geodetic elevations can change with time, the most up-to-date measurement sources must be consulted, independent of this site, to ensure accurate transformations for these high-stakes applications.

The values in this conversion calculator were last updated January 2020.

Location:

Geodetic Elevation: (meters)

Local Tidal Elevation: (meters)

In Depth

- Alaska Local Tidal Datums: An Introduction
- Frequently Asked Questions
- 2019 - Update Summary
- Alaska Tidal Datum Reference Table
- Alaska Benchmark Priorities

More Resources

- Historic Water Level Data for Alaska
- ODIN webmap of CO-OPS stations
- Tidal Datum Definitions
- What is a datum?
- Why am I "Mean" about Sea Level?
- Introduction to Geodetic Vertical Datums
- Vertically Challenged: The Progression of Vertical Datums
- Fantastic Tidal Datums
- OPUS: Online Positioning User Service



Creating and Submitting CUSP Data

CUSP Attribution

SOURCE_ID

Source Identification of feature.

SRC_DATE

Date of source imagery or Lidar for the feature

VER_DATE

YYYYMMDD

HOR_ACC

Horizontal positional accuracy (meters)

DATA_SOURC

Aerial Photography
Satellite Imagery
Lidar
IFSAR
SAR
HyperSpectral
Multispectral

EX_METH

Derived
Mono
Stereo

ATTRIBUTE

Breakwater.Bare
Groin.Bare
Jetty.Bare
Man-made
Man-made.Bulkhead Or Sea Wall
Man-made.Bulkhead Or Sea Wall.Ruins
Man-made.Canal.Navigable
Man-made.Canal.Navigable.Approximate
Man-made.Canal.Non-navigable
Man-made.Drydock.Permanent
Man-made.Lock
Man-made.Ramp
Man-made.Rip Rap
Man-made.Slipway
Man-made.Wharf Or Quay
Man-made.Wharf Or Quay.Ruins
Natural
Natural.Apparent.Marsh Or Swamp
Natural.Apparent.Mangrove Or Cypress
Natural.Glacier
Natural.Great Lake Or Lake Or Pond
Natural.Great Lake Or Lake Or Pond.Approximate
Natural.Mean High Water
Natural.Mean High Water.Approximate
Natural.Mean Water Level
Natural.River Or Stream
Natural.River Or Stream.Approximate
Stream.Perennial
Undetermined
Undetermined.Approximate
Undetermined.Estimated

INFORM

Ancillary Information (e.g. Describing or defining a feature)

SRC_RESOLU

Resolution of source (imagery or grid) used for compiling shoreline.

DAT_SET_CR

Data Set Credit of original compiled shoreline

SRC_CITA

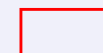
Source Citation used for compilation

FIPS_ALPHA

Two- letter FIPS State Alpha Code

NOAA_Regio

NOAA Regional Collaboration



Required Attribute

Natural.Mean High Water

- Mean high water shoreline based on vertical modeling or image interpretation using water level stations and/or shoreline indicators
- Within 20 meters of physical location

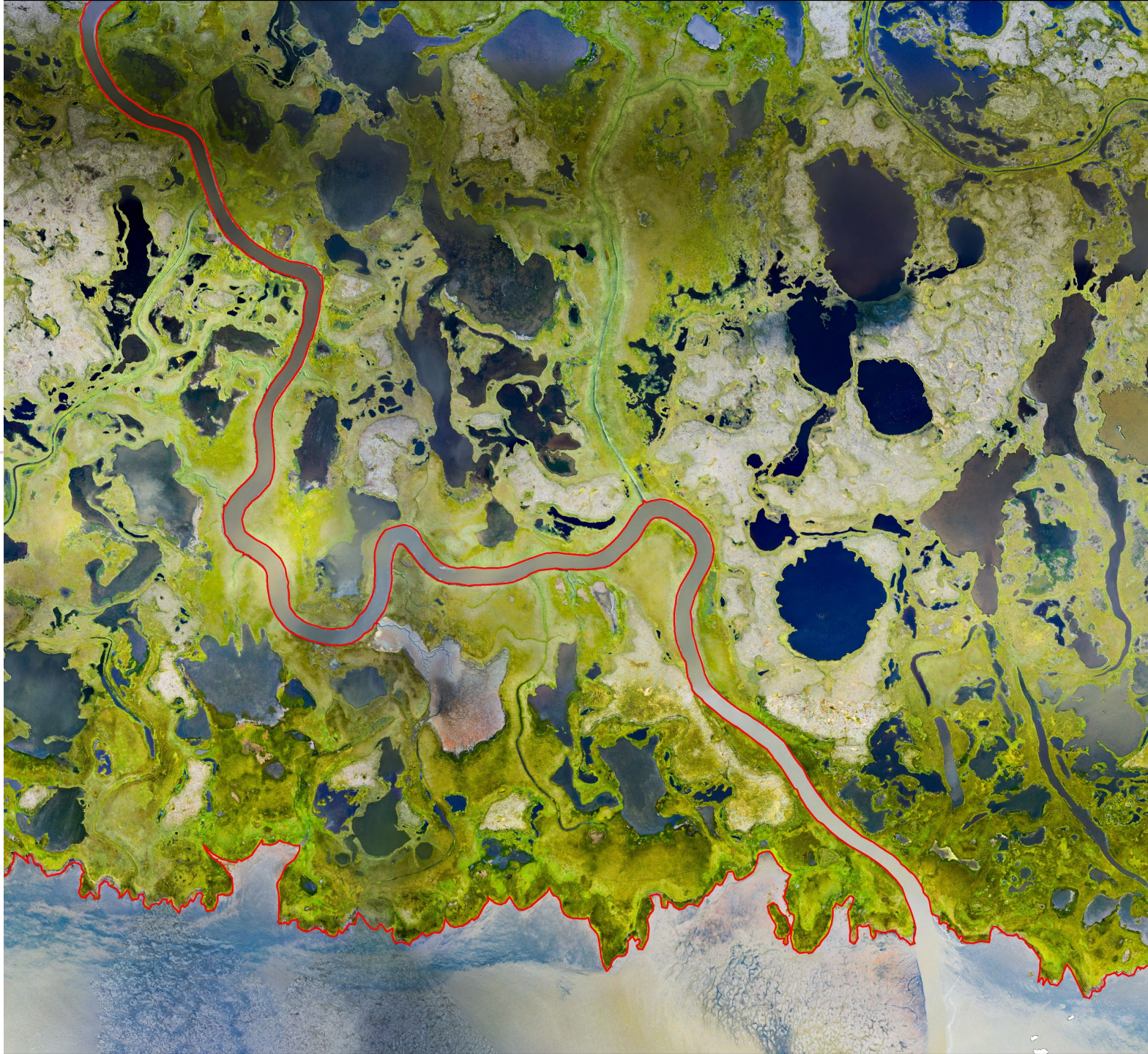


Shoreline indicator: wet/dry line



Natural.River Or Stream

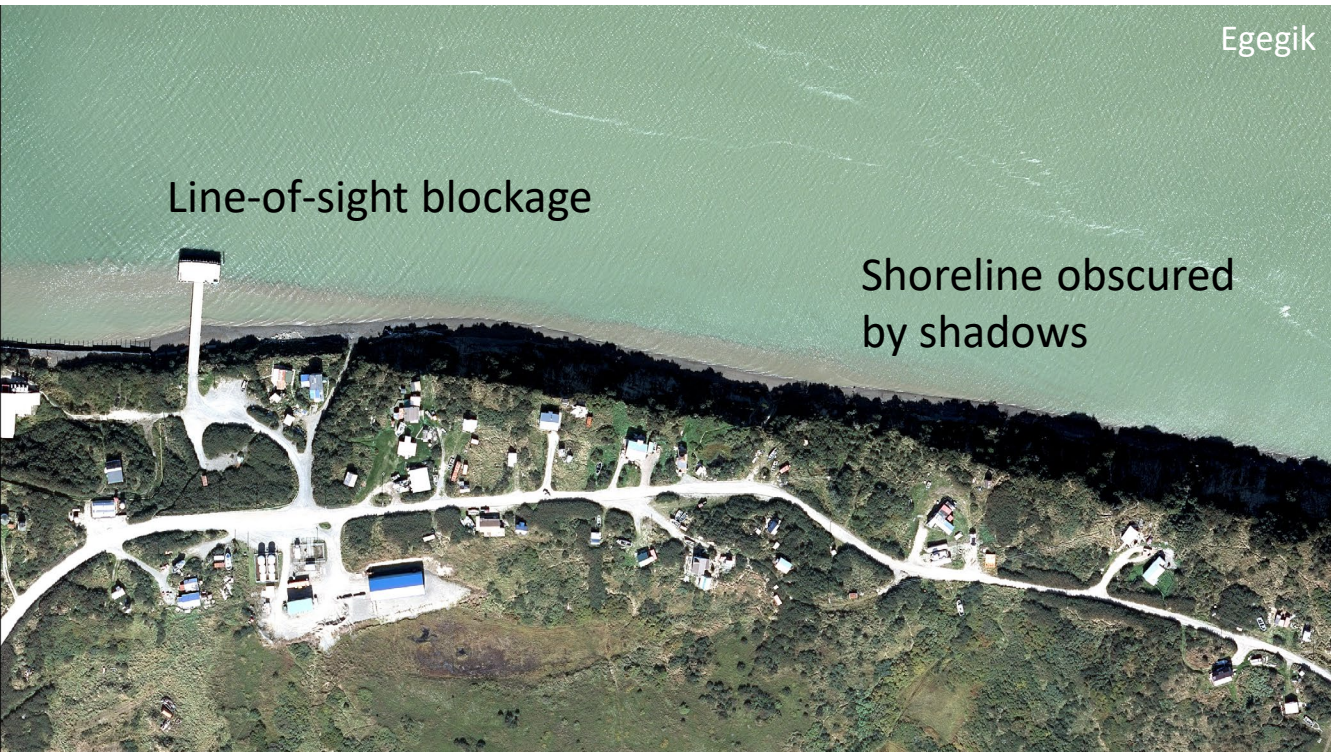
- Course of running water greater than 5 meters in width
- Within 20 meters of physical location



When to apply Approximate attribute

- Doesn't meet definition of Accurate (20 meters)
- Is within 100 ft (30.5 m)
- Can be used for shorelines exposed to high energy forces that continually shift

(Natural.Mean High Water.Approximate)



Delineating Streams

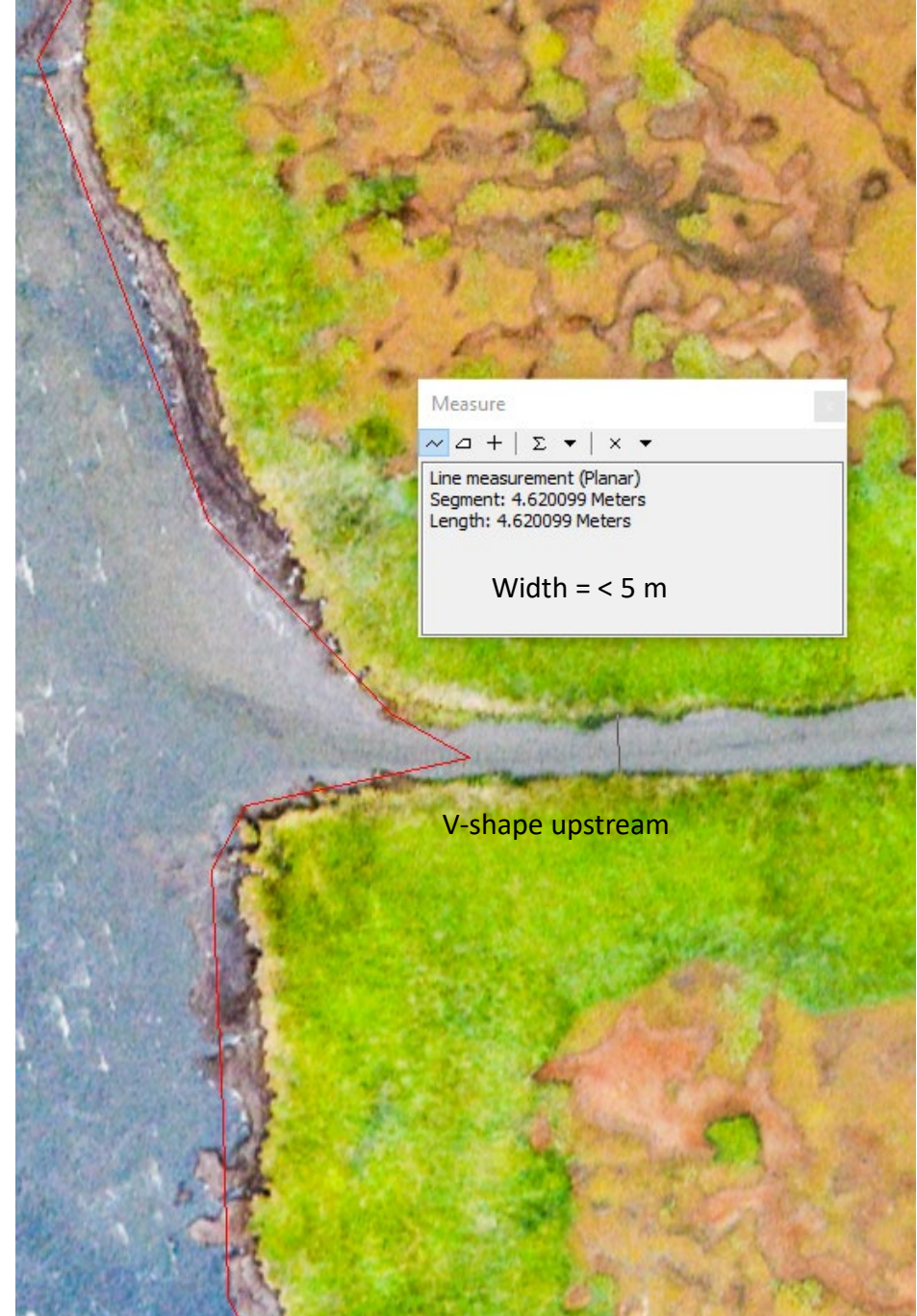
- No generalization
- < 5 meter cut-off
 - Closed with V-shape pointed upstream
 - Doesn't re-open further upstream



Would need to delineate throughout



Doesn't re-open



Measure

~ □ + | Σ ▾ | × ▾

Line measurement (Planar)
Segment: 4.620099 Meters
Length: 4.620099 Meters

Width = < 5 m

V-shape upstream



Encountering Structures

- Function over material
- Compile shoreline through structures (bridges, docks)
- Breakwaters delineated around perimeter
 - Double-line regardless on width of structure

Erosion Protection Attributes

- Man-made.Bulkhead Or Sea Wall
 - Includes Gabion
- Man-made.Rap Rap
- Man-made.Bulkhead Or Sea Wall.Ruins
 - Damaged structure in need of repair



An aerial photograph of a coastal area, likely in Alaska, showing a large river system with multiple channels and a wide delta. The surrounding land is a mix of green marshes and brownish-grey areas, possibly mudflats or low-lying vegetation. The water is a light blue-grey color. The image is used as a background for the slide.

General Rules

- Shorelines attributed unless ≤ 2 m along continuous line
- Shoreline type variations ignored along ≤ 2 meters of shoreline
 - Unless considered significant
- No generalization
 - Exception: grouping of small homogenous objects (marsh)
 - < 5 meters in width and length, ≤ 10 meters apart from one another
- Check topology – make sure vectors are connecting



NOAA's Continually Updated Shoreline Product

NOAA's National Geodetic Survey (NGS) has developed an ambitious project—the Continually Updated Shoreline Product (CUSP)—to provide the most current shoreline representation of the United States and its territories.

Why a new continuous shoreline?

At least 15 federal agencies, most coastal state and local organizations, as well as academic institutions and private companies are consumers of coastal mapping data. Shoreline data assists decision makers in developing coastal community plans, managing resources, mitigating hazard events, conducting environmental analyses, and more.

Goal for CUSP

Shoreline is a dynamic interface between land and water. Over the years, several continuous shorelines have been developed, but many may not have been maintained and, therefore, no longer adequately represent changes to the land-water interface. CUSP has been designed to deliver continuous shoreline with frequent updates.

CUSP will identify surveys for inclusion, employ state-of-the-art technology for cartographic review and validation, attribute shoreline features, and develop a strategy to delineate shoreline as it becomes available. Where applicable, CUSP will reference a mean-high water shoreline based on vertical modeling or image interpretation using both water level stations and/or shoreline indicators.



Data Sources for CUSP

CUSP is built upon NGS National Shoreline data and uses both NOAA and non-NOAA contemporary sources to replace older vintage shoreline areas. These data sources—coupled with NOAA tools (such as VDatum) and outside-sourced data sets which meet NOAA standards—contribute to the creation of a continually updated shoreline.

NOAA is exploring additional data sources for CUSP. Shoreline providers who wish to contribute their data to CUSP are encouraged to contact us.

For more information, contact NGS:

- On the Web
geodesy.noaa.gov/CUSP
- By email
ngs.shoreline@noaa.gov

Questions?



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Point of Contact:

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NOAA CONTINUALLY UPDATED SHORELINE PRODUCT (CUSP)

Purpose and Potential Applications: This data set was created to deliver continuous shoreline with frequent updates to support various GIS applications including coastal and marine spatial planning, tsunami and storm surge modeling, hazard delineation and mitigation, environmental studies and may assist in nautical chart updates.

Data Access

[CUSP](#)

Originator(s): National Oceanic and Atmospheric Administration (NOAA) National Geodetic Survey (NGS)

Abstract: NOAA's Continually Updated Shoreline includes all national shoreline that has been verified by contemporary imagery and shoreline from other non-NOAA sources. This shoreline vector only includes shoreline and alongshore features that represent shoreline (groin, breakwater, and jetty).

Access: [NOAA Continually Updated Shoreline Product \(CUSP\)](#)

Scale(s): 1:1,000 – 1:24,000

Coverage: Continental U.S. with portions of Hawaii, Pacific Islands, Alaska, Puerto Rico, and the U.S. Virgin Islands

Source Data: National Shoreline vectors and non-NOAA sources including lidar, imagery and shoreline vectors.

Spatial Reference: Geographic coordinate system (decimal degrees); Horizontal Datum – North American Datum of 1983 (NAD83)

Tidal Datum: Where applicable, CUSP will reference a mean-high water shoreline based on vertical modeling or image interpretation using both water level stations and/or shoreline indicators.

Data Format: ESRI shapefile. Shoreline data is distributed as a nationally seamless polyline.

Accuracy: Variable depending on source. This shoreline is not to be used for legal purpose since it includes shoreline compilation with less stringent data acquisition requirements and quality control measures as compared to the National shoreline.

Process Description: Individual national shoreline projects and high-resolution LiDAR-derived shoreline were merged to form the framework of this product. Individual projects are edge matched using contemporary imagery as a guide. Single-line alongshore features and alongshore features where water passes underneath are not included in this shoreline data set. The current attributes include source id, data source, horizontal accuracy, information field, attribute name, image verification date, source resolution, data source, extraction method (mono versus stereo), and source citation. The shoreline will be updated without regard to maintaining versions.

Limited shoreline updates to existing vectors may be edited using verification imagery when the vectors and the imagery register well together, or when the updated vectors can be shifted to existing accurate vectors. Once verification imagery meets the accuracy criteria stated above, the decision to compile features is based on the ability to extract a proxy mean high water line considering water level, image date, resolution, accuracy, and shoreline slope. New shoreline compilation from contemporary commercial satellite and orthomosaic imagery may be used to compile new shoreline based on those same considerations.

CUSP shoreline emphasizes the most current temporal positioning versus the most accurately acquired data. The mapping of the most current temporal positioning of the proxy mean high water for this product excludes the effects of seasonal (summer versus winter beaches) and storm response (northeasters and hurricanes) on spatial variability of beach morphology.

Point of Contact:

Doug Graham
NOAA National Geodetic Survey
Doug.Graham@noaa.gov

Other References:

- [CUSP description](#)