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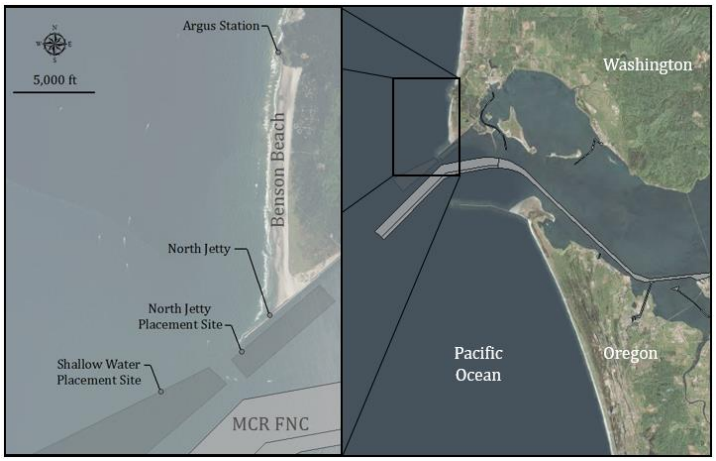
National Regional Sediment Management Program Portland District (NWP):

North Head Argus Station Engineering Products for Improved Regional Sediment Management

Description

Since 2016 Portland District (NWP) has contracted with Oregon State University (OSU) for the operation of Argus Cameras mounted in the North Head Lighthouse at the Mouth of the Columbia River (MCR). NWP primarily uses the cameras to track the movement of nearshore berms, and the erosion of an area north of the MCR North Jetty. In prior years the station was run by Northwest Research Associates (under NWP contract) to analyze raw Argus data to provide insight on the morphodynamics of the site. This RSM project will work with NWP and ERDC and OSU researchers to develop automated real-time engineering analysis tools turning the Argus data into actionable information for NWP and removing the reliance on contractor support for data analysis.

This project will leverage the Corps Data Integration Framework to store the Argus data in easy access data formats and develop analytical tools to provide information on shoreline and sandbar position, wave runup excursions, and work towards providing derived beach volume estimates and nearshore water depths. All products will be stored on a THREDDS server for easy access and NWP will be provided with interactive tools to access and visualize the data. This effort will improve the Corps ability to utilize coastal video imaging for quantitative engineering analysis and all tools will be applicable to other types of image-based monitoring, including UAS data collection.



North Head Argus Orientation and Proximity to NWP MCR FNC and Placement Sites.

Issue/Challenge To Address

Research in academia over the last 30 years has led to the development of video imaging methodology and algorithms that can be used as a quantitative tool for coastal monitoring (see, for example, the Argus system, Holman & Stanley, 2007). Video imagery exploits the surface signature of breaking and shoaling waves in the surf-zone to make quantitative measurements of coastal processes continuously during daylight hours. Quantitative products include shoreline position, maximum runup extent, nearshore water depths, and surf-zone currents, which can be used to track regional sediment movements. Despite the high-value data sets and observations that these techniques provide, few of these approaches have actually made it into engineering use for monitoring of USACE navigation waterways or beach projects, due largely to a lack of focus on transition from the academic community and perceived high startup costs.

NWP has exploited coastal video imaging data products in their RSM practices, utilizing an Argus station installed at North Head lighthouse. The Argus station was installed in

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2004 and run by Northwest Research Associates until 2012, providing a continuous time-series of nearshore morphology, including nearshore placement of dredge material.

Unfortunately many of the existing coastal imaging analysis algorithms, while operationally robust, provide data products that require expert analysis to convert into useful engineering data. Data are stored in a difficult to access database which does not stay current with data sharing standards. To create engineering products, the data must be downloaded to a local computer and use licensed software to read. In their current state, many algorithms are not explicitly automated and require an "expert" user to set them up and interpret results. In addition it is unclear how to relate the available data products to existing engineering guidelines and integrate the data with USACE numerical models.

Successes Lessons Learned

Argus data has been collected in this area since 2004, and additional data sets from previous studies are available to contribute to the project. Argus capabilities at MCR were expanded in 2013 as part of an ONR effort on remote sensing. Additionally, Argus experts Rob Holman and John Stanley are located close to NWP and are readily available to assist.

Expected Products

- Real-time access to netCDF image products
- Three imagery-derived engineering products for analysis of sediment movement and RSM practices at the beach adjacent to the Columbia River mouth.
- Tech Note on imagery-derived engineering products
- Tech Notes on web tool

Stakeholders/Users

ERDC, NWP, NRL, Columbia River Bar Pilots, Port of Ilwaco, Port of Chinook, Port of Astoria, potentially all users of the MCR FNC

Projected Benefits Value Added

Direct cost savings and scientific added value through improved understanding of regional sediment dynamics for NWP and other District employment of video imaging as a coastal monitoring tool from either tower-based or UAS-based platforms. In-situ surveys are expensive and dangerous, often preventing the necessary monitoring of navigation channels or storm-damage protection project sites. Without proper monitoring, Districts are often forced to rely on numerical modeling results in complicated systems which prevent accurate planning and assessment. Automated tools will enable easy access to coastal imaging data and reliance on contractor support to interpret and analyze the data.

Leveraging Opportunities

This project leverages $95,450 NWP for OSU, $200K Coastal Field Data Collection Program, $200K Flood & Coastal program, $400K Military Engineering, and ERDC's commitment to the Coastal Imaging Research Network (https://coastal-imaging-research-network.github.io/#/).

Points of Contact

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Participating Partners

Oregon State University, NWP, ERDC