US Army Corps of Engineers®
Engineer Research and Development Center

National Regional Sediment Management Program Jacksonville District (SAJ):

Continuous Monitoring of a Nearshore Berm Placement at New Smyrna Beach, FL via Coastal Imagery

Description

In August 2018 Volusia County, FL started to utilize up to 500,000 cy of dredged material from Ponce de Leon Inlet to renourish New Smyrna Beach (NSB), FL in the form of a nearshore berm (Figure 1A). To monitor the behavior and performance of the placement, ERDC researchers have deployed a prototype Mini-Argus coastal imaging monitoring station. The mini-Argus system will deliver hourly quantitative imagery of the NSB project, which will be exploited to provide nearshore depth estimates, sandbar/berm position, maximum wave run up, and average shoreline position. **This RSM initiative aims to develop a new capability for the mini-Argus system: high frequency topographic profile measurements from stereo imaging; and leverage the pilot NSB deployment as a testing ground for its application in RSM practices.**

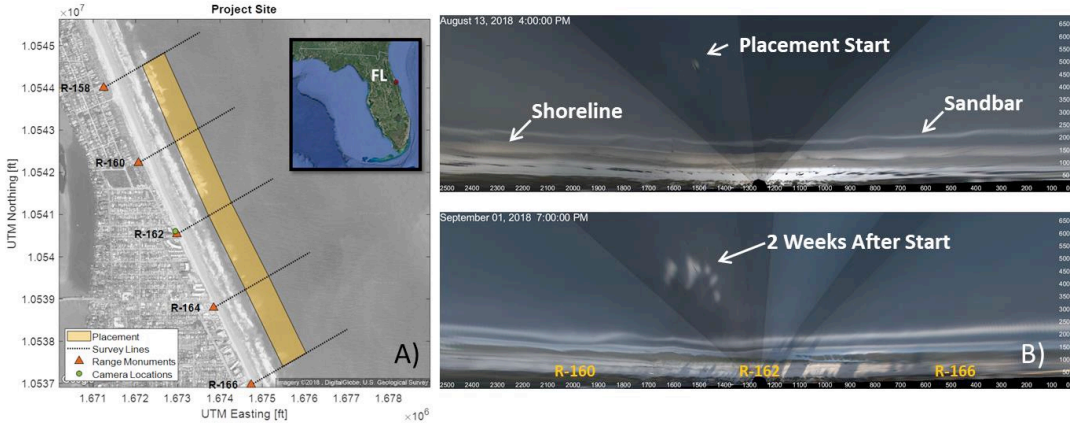

Figure 1: NSB Project Site *(Left)*. Example mini-Argus georectified imagery at NSB *(right)*. White areas indicate wave breaking, a proxy for sand bar/placement location.

Issue/Challenge To Address

USACE ERDC and RSM have conducted research on the effectiveness, monitoring, and design of nearshore berm placements; survey frequency has been suggested every few months for 1-3 years after placement. Unfortunately, traditional surveys at such frequencies can be impractical due to high temporal and financial costs. Coastal imaging is an established and promising tool to supplement traditional survey data. ERDC researchers are developing their own self-contained and autonomous camera system, Mini-Argus, to provide high frequency beach project monitoring to supplement low frequency surveys; the pilot District application deployment is the 2018 NSB nourishment.

The mini-Argus system has delivered quantitative imagery of the NSB project in real time (Figure 1B; hourly). Such imagery can be exploited to provide nearshore depth estimates, sandbar/berm position, maximum wave run up, and average shoreline position. However, SAJ has indicated that high-frequency observations of beach volume change would be advantageous to their RSM analysis. Coastal topography can be derived from stereo imaging, however this approach has not been operationalized or integrated into the Argus architecture. This RSM initiative will integrate stereo imaging into the processing workflow of Mini-Argus data to provide high frequency (>daily) topographic beach profiles of the NSB nourishment area.

Successes Lessons Learned

Successes and lessons learned will be compiled during the duration of this study.

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Estimated Benefits & Cost Savings

- $20-30K cost savings per each traditional in-situ survey replaced
- Benefits & reduced lifecycle costs associated with adaptive management capabilities
- Increased understanding of nearshore berm performance and beach profile response

Expected Products

- Dataset of coastal morphologic profiles and image products with improved accuracy
- Presentation/Paper at Coastal Sediments 2019 Conference in St. Petersburg, FL
- Technical Note evaluating initiative

Stakeholders/Users

Stakeholders and users include Volusia County, the city of New Smyrna Beach, beach front property owners, and recreational beach users.

Projected Benefits Value Added

This RSM initiative provides the Corps added value in terms of direct cost savings and increased capabilities. High frequency topographic profiles from coastal imaging reduce the need for in-situ traditional surveys which can cost 20-30 K per survey and may be dangerous to collect. This is applicable not only to SAJ but other districts where monitoring of navigation channel or storm-damage infrastructure is necessary. This cost-savings will reduce lifecycle costs in addition to those afforded by this new adaptive management capability. Continuous profile monitoring will allow district engineers to make faster and more informed decisions for restoration projects, potentially saving costs. High frequency monitoring will also help engineers and researchers understand beach profile response and performance, expanding and enhancing the RSM knowledge base and practices.

Leveraging Opportunities

This RSM initiative leverages heavily across business lines to fund the pilot deployment of the Mini-Argus system at New Smyrna Beach as well as data access development (web-tools). The initiative leverages elements of $125K in annual Coastal Field Data Collection Program (CFDC) funds that support the FRF Remote Sensing work unit within CHL-COAB, $200K in Coastal Ocean Data Systems (CODS) funds which have supported the development of the mini-Argus Hardware, over $500K in Military Engineering funds that support the 6.2 Bathymetry inversion and 6.3 Standoff Sending work unit, and $300K in Flood & Coastal (F+C) funds that have supported the development of the analysis software. Data format and access development will leverage heavily from RSM FY18 North Head Argus project funds. This proposal also leverages ERDC's working commitment to the Coastal Imaging Research Network (CIRN https://coastal-imaging-research-network.github.io/#/), an open source code repository and research community committed to improving access to and use of coastal video imagery in engineering and science operations and research. In addition, this project leverages staff support and traditional surveys for the berm placement which will allow for Mini-Argus accuracy assessments.

Points of Contact

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Participating Partners

Volusia County
CIRN: Coastal Imaging Research Network