



Photo Date: 8 October 2015

# Bald Head Island, N.C. Beach Monitoring Program

## Monitoring Report No. 14 (April 2015 to April 2016)

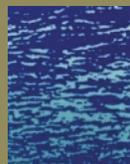
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Village of Bald Head Island

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**BALD HEAD ISLAND, N.C.**  
**Beach Monitoring Program**  
**Report No. 14**  
**(April 2015 – April 2016)**

**EXECUTIVE SUMMARY**

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This engineering report presents the physical changes along the South Beach, West Beach and East Beach shorelines of Bald Head Island (BHI) based principally upon historical and recent monitoring surveys performed on behalf of the Village of Bald Head Island (Village). It likewise addresses actions taken by the Village or others which have or could affect shoreline conditions. More, specifically, this report addresses:

- (1) A summary of Bald Head Island's physical setting including a discussion of the Federal Navigation Channel and the Wilmington Harbor Sand Management Plan.
- (2) A summary of historical erosion control activities on Bald Head Island constructed by the Village.
- (3) A discussion of the most recent 2015 1.33 Mcy federal beach disposal project carried out at South Beach by the Wilmington District, COE.
- (4) Recent volume and shoreline position changes measured between monitoring surveys of April 2015, November 2015 and April 2016 along West Beach, "the Point" and the South Beach shoreline, as well as *long-term changes* since November 2000. Updates of East Beach and the Cape Fear Spit conditions are likewise provided, as well as near term changes for the Row Boat Row shoreline which was added to the monitoring program in 2015.
- (5) Measured changes in the Bald Head Creek borrow site last utilized for the 2012 Post-Irene small scale mitigation project. An additional condition survey in 2016 was performed for purposes of assessing the Creek site's potential reuse as a sand source in the near future.
- (6) A discussion of the Village's terminal groin project construction in 2015 following a spring 2015 federal beach disposal event. Additional survey data required to monitor the performance of that project are likewise included. Any project related changes between the November 2015 and the May 2016 monitoring surveys are presented.
- (7) A discussion of the extension of the two (2) rock jetties which protect the entrance channel to Bald Head Marina and the continuing need to bypass sand from West Beach to the Row Boat Row shorefront.
- (8) An overview of newly proposed shore stabilization efforts by the Village which presently include the development of a Frying Pan Shoals borrow site, the construction of four (4) detached rock breakwaters seaward of the Row Boat Row shoreline and the probable need for sand placement along portions of West Beach.

The most recent Wilmington Harbor Inner Ocean Bar maintenance dredging of Bald Head Shoal Channel Reaches 1 and 2, as well as the Smith Island Channel segment occurred between January and April 2015. The work was performed by a cutter-suction dredge. The CORPS contractor was Great Lakes Dredge and Dock Company. Approximately 1.33 Mcy of sand excavated during that operation was placed along S. Beach at Bald Head Island. For this project, the Village of Bald Head Island was required to contribute approximately \$945,000 in order to have sand placed so as to enhance fillet formation updrift of the 1,300 ft terminal groin constructed after the disposal project.

Between November 2000 and April 2015, Bald Head Island has received over 7.0 Mcy, of sand from the initial widening/deepening and four (4) subsequent maintenance dredging operations associated with the Wilmington Harbor Navigation Project ocean entrance channel. That work was performed in accordance with the original Wilmington Harbor Sand Management Plan. In addition, the Village was required to place approximately 1.85 Mcy of sand in the form of an “engineered beach” intended to offset the adverse consequences of a channel maintenance event contracted to occur at the Oak Island alternate disposal location. Prior to that, the Village constructed a 47,000 cy fill along West Beach. In 2012, the Village constructed a Post-Irene emergency fill comprised of 138,000 cy of sand dredged from Bald Head Creek. Accordingly, in the net, Bald Head Island has experienced a total estimated sand placement volume of over 9 Mcy since November 2000.

Prior to the most recent 2015 federal disposal project, the *gross* volumetric sediment *loss* over the November 2000 to April 2015 monitoring timeframe was conservatively computed at -5,733,100 cy, or approximately 371,700 cy per year – on “average”. The assignment of an average annual long-term rate of sand loss at Bald Head Island however, is *not* necessarily a meaningful indicator of navigation project impact. Such an “average rate” has been often temporally biased by periods of beach fill equilibration, sand tube groinfield effectiveness, major storm events, the occurrence of episodic destabilizing dredging events in close proximity to the island, as well as other physiographic phenomena temporally affecting annualized quantities of alongshore sediment transport – from Bald Head Island.

Even though the latest (post-disposal) April 2016 monitoring survey documents some +3.306 Mcy of additional sand within the island’s littoral system since November 2000 (*after* fill placement of over 9 Mcy), surveys performed prior to each federal disposal event have documented areas of S. Beach with large *net loss* (nearest the inlet) and large *net gain* (eastward thereof). Hence, this report’s continuing conclusion that certain basic tenets of the F.O.N.S.I. and *Environmental Assessment* (USACE, 2000) regarding assurances of no net impact to Bald Head Island – that ultimately led to the favorable C.Z.M. consistency finding by the State of N.C. – have not been fully met. It is currently the position of the Village of

Bald Head Island that these findings continue to be relevant to the Wilmington District's ongoing re-evaluation and proposed update of the Wilmington Harbor Sand Management Plan (WHSMP). Affecting this conclusion is the fact that the Village has not only placed in excess of 2 Mcy at their expense since 2000, but also has been required to build a \$4.5M terminal groin (in 2015) immediately abutting the navigation project so as to reduce annual sediment losses to the channel – as well as maintain a beneficial shoreline configuration seaward of the line of development.

In this regard, comprehensive beach monitoring over the past fifteen years by the Village of Bald Head Island has resulted in the conclusion that sand placement alone has *not* served to offset navigational channel impacts to the west end of South Beach thereby resulting in chronic rates of erosion and consistent northerly recession and migration of the Point. The net result of these phenomena has historically been periods of accelerated erosion and ensuing threat to public infrastructure, homes, protective dunes and wildlife habitat.

As a result, in 2015 the Village constructed a single terminal groin designed to complement the future placement of beach fill at South Beach. Theoretically, the project involves 2 Phases. The Phase-1 1,300 ft. long terminal groin was designed as a “leaky” structure (*i.e.* semi-permeable) so as to provide for some level of sand transport to West Beach and portions of the Point (located northward of the proposed groin). Similarly, the structure serves as a “template” for channel disposal material recently placed (spring 2015) eastward thereof on South Beach. It can reasonably be shown that the construction of such a structure should likewise have some level of benefit to the abutting navigation channel. Construction of the structure was initiated in May/June 2015 and determined to be complete by December 2015. By Permit, the Village has the option to extend the groin in the future by varying amounts up to an ultimate length of 1,900 ft. – if determined to be necessary.

Although not directly impacted by long-term navigation channel improvements and maintenance of the Cape Fear River entrance, the Village Council elected to initiate monitoring of the East Beach shorefront at Bald Head Island in 2008. It is observed at this location that East Beach principally undergoes strong seasonal variations of beach width and profile volume to a large degree dependent upon storm frequency and intensity, as well as the ever-changing configuration of the Cape Fear Spit. The current April 2016 survey data show a net shoreline accretion of approximately +20,400 cy (above elevation -16 ft NGVD) throughout the 3,000 ft East Beach shoreline lying northward of Cape Fear. Conversely, the spit configuration has adversely impacted the S. Beach shorefront at the Shoals Club. Documentation of this effect is addressed in this report.

The third and final year of permit required monitoring of the Bald Head Creek borrow site was performed in October 2015. During the Year 2 to 3 monitoring period (16 months) the permitted borrow site area gained approximately 33,500 cy. A condition survey was performed in April 2016 – due to the probable reuse of the site as a sand source for West Beach and Row-Boat-Row fill placement projects in the near future. To date, approximately 70,000 cy (i.e. 51%) of the estimated dredge volume of 137,990 cy has “recovered”. Permit required monitoring of the Jay Bird Shoal borrow site is not scheduled to occur again until May 2017 (i.e. year 7).

In early 2015, the Village initiated a project to extend the two (2) jetties stabilizing the entrance channel to the Bald Head Island marina. The purpose of the project was to reduce high frequency channel maintenance and sand bypass dredging necessary to keep the channel clear for safe and reliable barge and ferry vessel operations. At about the same time, the Village assumed responsibility for all future channel maintenance and sand bypass requirements from BHI, Ltd. The success of the jetty extension project has however resulted in the cessation of almost monthly sand disposal events performed along the Row-Boat-Row shorefront by BHI, Ltd. The net result has been erosion and recession of the beach at that location. Accordingly, in April 2016, the Village submitted a permit application to construct four (4) small low-profile detached breakwaters seaward of the affected shorefront. Subsequently sand will be placed at that location from bypass and/or the Bald Head Creek borrow site. After the construction of additional stabilizing structures, future sand maintenance requirements should be minimal and easily addressed by limited sand bypass operations performed once or twice a year.

In April 2016, a *Sand Source Investigation of Frying Pan Shoals* (Olsen 2016) was completed and submitted to the Village. The nexus for the study was the findings of the E.I.S. performed for the terminal groin project which acknowledged the need for additional sand sources required for both beach renourishment and compliance with permit conditions necessitating that the updrift fillet of the structure be maintained into the future. In May 2016, a Phase II Cultural Resource Investigation was authorized within the limits of a preliminarily identified borrow area.

A running chronology of detailed *annual* monitoring results for the Bald Head Island Shorelines (since 2000) are available from *Bald Head Island, N.C. Beach Monitoring Program Report No. 1* (Olsen 2003), through *Report No. 13* (Olsen 2015).